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VEGETATION AND SOILS OF THE ROCK SPRINGS WATERSHED

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Wilbert H. Blackburn[1/], Richard E. Eckert, Jr.[2/]
and
Paul T. Tueller[3/]

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Map - Rock Springs Watershed

INTRODUCTION

Rock Springs Watershed is located in northeastern Elko County about 50 airline miles northeast of Wells, Nevada (Figure 1).

The basin is within the Elko District of the Bureau of Land Management. It consists of approximately 47,120 acres (76 square miles). The watershed lies within the north central part of the Basin and Range physiographic province and consists of north-south trending mountains separated by small valleys (Hunt, 1967). The altitude of the highest peak is around 8000 feet and the basin outlet is approximately 5100 feet. Relief between the mountains and adjoining valleys rarely exceeds 1600 feet.

Geologic parent material is mainly alluvium and tuff with some sandstone, basalt and andesite.

Water in the basin flows briefly in ephemeral streams from snow melt or thunderstorms. The drainage is south to Thousand Spring Creek. A number of perennial springs and a few wells are found in the watershed.

Climate of the basin is semi-arid. Annual precipitation for a 5-year period (1965 through 1969) ranged from 8.0 to 13.6 inches. Comparisons with known records at Wells indicated two below average, and three above average precipitation years. Monthly precipitation exceeded 1.0 inch in December, May and June (Figure 2). During the 1929 to 1969 period, the approximate temperature at the lower elevations of the basin ranged from a low of -32°F to a high of 107°F with the average annual temperature of 44.7°F.

Two vegetation zones are represented in the watershed: northern desert shrub and juniper. Soils are mostly Aridisols and Mollisols with a few Entisols.

On July 24, 1966, 6511 acres of the watershed burned. These acres were mostly in the sagebrush type with a small area of juniper. All of the burned area that was reseedable (5462 acres) was contour ripped and planted to either crested wheatgrass and some Ladak alfalfa or sweet clover or intermediate wheatgrass and the same legumes depending on the site. Three thousand acres adjacent to the burned area was sprayed with 2,4-D in June of 1967. This same year a protective fence was constructed around the treated areas to insure proper use. The vegetation data for the watershed was gathered before July 24, 1966, therefore, the plant communities are described as they occurred before the burn. At present the basin is used mostly for grazing cattle during the summer.

Wildlife in the area consists primarily of sagegrouse and mule deer. Recreation use is low. The few annual visitors are primarily interested in hunting.

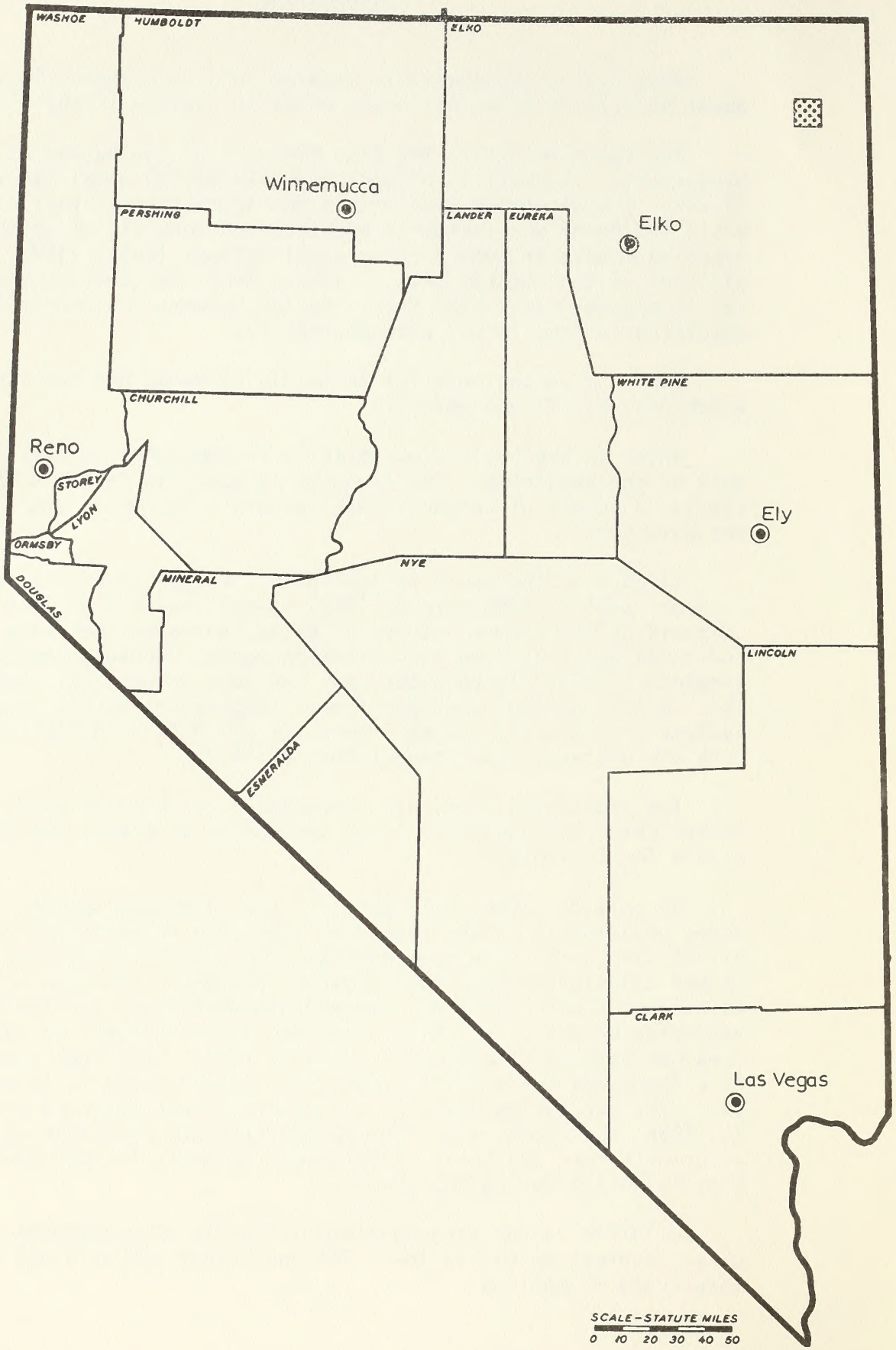

Figure 1 ▨ Location Of The Rock Springs Watershed In Nevada

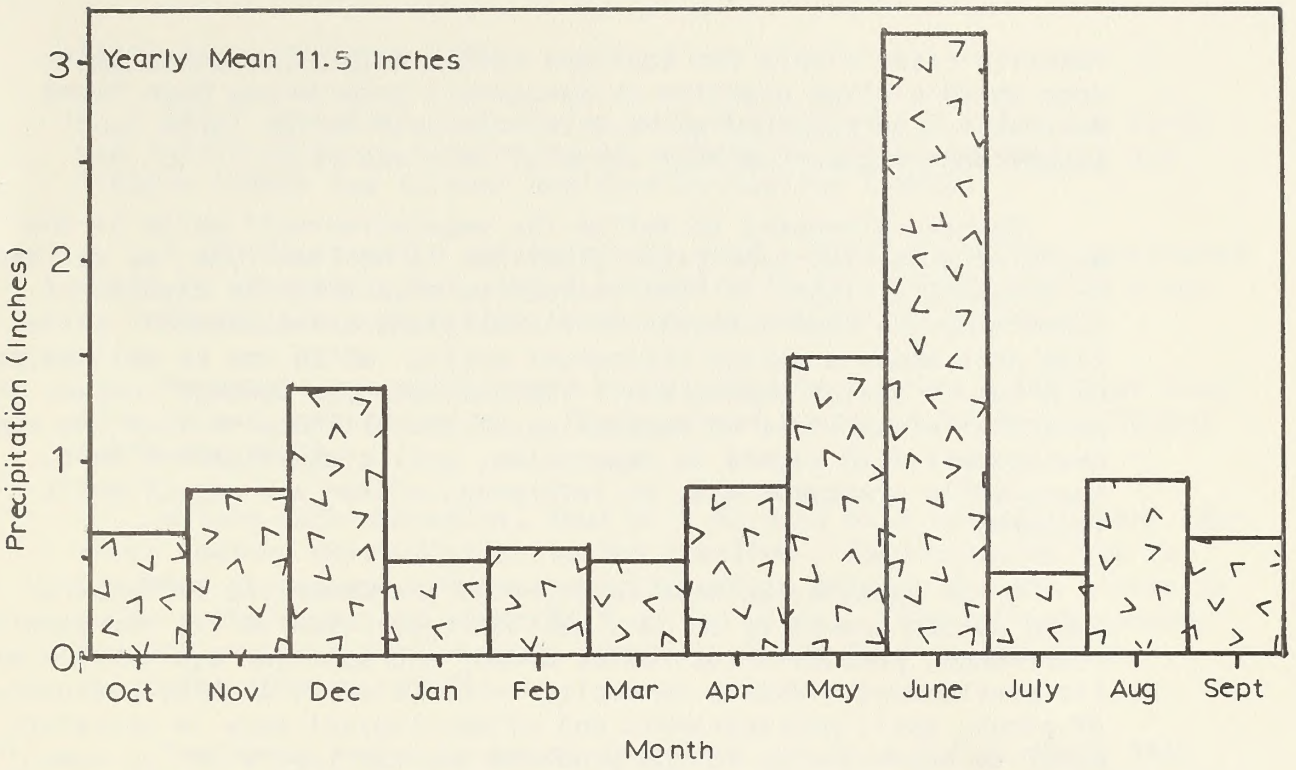

Figure 2. Mean monthly precipitation for the Rock Springs Watershed.

Land managers constantly require factual information on which to base their programs. There is a special need for detailed data about the vegetation and soils on rangelands. Materials included in this report describes the climax and seral units of vegetation and associated soils in the Rock Springs Watershed. This is one of 12 range watershed study areas in Nevada administered by the U.S. Department of the Interior, Bureau of Land Management. The vegetation-soil analysis herein reported is a portion of a cooperative research effort between the Bureau of Land Management and the Renewable Resources Center of the University of Nevada Reno.

This study was designed as a multiple-purpose ecological inventory of vegetation and soil resources. The study provides fundamental information which can be interpreted and re-interpreted as use patterns change and as understanding increases without the need for a complete re-survey as new uses are emphasized.

The value of data outlined in this report lies in the development of relationships between vegetation and soil and the resultant indicator significance of vegetation. For example, a classification of the basic ecological units is necessary for a thorough understanding of the landscape and interpretation of site potential. However, site potential for a given vegetation-soil unit requires further analysis and the accumulation of data about the value of a management practice if it were applied to the unit inquestion. Much of these data are not yet available. Management recommendations are curtailed due to a lack of data relating to vegetation-soil units described herein. When such data become available, however, the land manager will be able to easily

identify sites within the confines of his unit of responsibility upon which a given practice or management program has been found desirable. An enhanced ability to precisely define range landscapes constitutes the real value of this analysis.

We have attempted to define the vegetation-soil units on the basis of a habitat-type classification. A habitat-type, as defined by Daubenmire (1952) is "the collective area which is capable of supporting the same homogeneous climax plant association." Collective area means a unique ecological entity which can be delineated on a map or aerial photograph. The habitat-type concept indexes site potential since it is an expression of the ultimate unit of the sum environment with regard to vegetation, soil classification unit, topographic placement and, by inference, micro- and mesoclimatic factors.

As an example, we have interpreted the *Artemisia tridentata/Stipa comata* community to be a habitat-type based on its homogeneity, recurrence, productivity, relict areas, and apparent equilibrium with its environment. When a community is not climax, careful evaluation of plant, soil, physiographic and climatological data is necessary in order to speculate as to the probable habitat-type with its specific potential. The *Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda* community is an example of seral vegetation. This community occurred on similar soil with similar physiographic placement and climate as *Artemisia tridentata/Agropyron spicatum* stands found elsewhere. On these bases, the *Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda* community was interpreted to be an *Artemisia tridentata/Agropyron spicatum* habitat-type. Similar evaluations have been made for most of the communities recognized in the watershed.

The first section of this report is a key to the 27 plant communities. This key refers the reader to the second section, a detailed description of each community. The third section is devoted to a discussion of management suitabilities and ecology of the watershed. This is followed by the appendices which contain precipitation data, soil families and sub-groups associated with the watershed plant communities, vegetation and soil association table. Finally a watershed map illustrates mapping units which consist of plant communities with their respective percentage indicated; roads, precipitation gages, townships, ranges and sections.

Methodology

The vegetation of the Rock Springs Watershed was delineated into plant communities during a reconnaissance. As general rule, all communities were recognized and delineated on the basis of vegetative characteristics alone. Then as soil and physiographic data were accumulated, this initial delineation was re-evaluated on several occasions until the 27 plant communities described in this report were finally identified and interpreted. These communities were given names corresponding to the major dominant and major sub-dominant species.

Basal Area and Cover Data

After the plant communities were delineated, an intensive study was initiated by an adaptation of methods described by Poulton and Tisdale (1960) and further modified by Tueller (1962).

A 100-foot-square macroplot was used. Five plots were considered ample to adequately describe a community (Eckert, 1957) but on minor or inaccessible communities, only one or two plots were used.

Permanent macroplots were established by running a 100-foot baseline up and down the slope. Plots placed on the level were oriented north and south.

Within each macroplot, four 4- x 50-foot belt transects were randomly located perpendicular to the baseline. Randomization was restricted to prevent transect overlap and to provide for two transects each in the upper and lower half of the plots. This two-way randomization provides for adequate sampling of the full length of the macroplot (Eckert, 1957).

Each belt transect was divided into ten 4- x 5-foot plots thus enabling forty 4- x 5-foot plots to be studied in each macroplot. Two kinds of data were obtained from each plot: (1) basal area of the more abundant grasses and forbs, and (2) crown cover estimates of shrubs. A 1-square-foot frame was used as an estimation guide for both basal area and crown cover data.

Basal area was selected because it is relatively free from yearly weather variations and grazing influences (Tueller, 1962). Dead centers which exceeded 25 percent of the area of bunchgrasses were excluded from the estimate. Basal area estimates by species were based on the following cover classes (Poulton, 1962):

Class	Class Range Percent	Midpoint Percent
1	0 - 1	0.5
2	1+ - 5	2.5
3	5+ - 10	7.5
4	10+ - 25	17.5
5	25+ - 50	37.5
6	50+ - 75	62.5
7	75+ - 95	85.0
8	95+ - 100	97.5

The midpoint of each class range was used in calculating cover percentage.

Shrub crown cover estimates were obtained by standing directly over the shrub and projecting the foliage cover onto the ground. Estimates were made for each species to the nearest 1 percent of the 4- x 5-foot plot. Openings in the canopy larger than one-quarter of a square foot were not included.

Cover data of species in the meadows were obtained with the point frame method described by Levy and Madden (1933).

Tree Density and Cover Data

Crown cover data of trees were obtained from a 66- x 132-foot plot. Trees found within the plots were counted by species and 10 typical tree crowns were measured. From this information the density (trees/acre) and the average tree cover was computed for each species by plot.

Frequency Data

Frequency, according to Cain and Castro (1959), is a percent presence in plots of a stated size. For example, if a sample of a stand consists of 200 plots, and if one or more plants of a given species occurs in 50 of these plots, the species has a frequency percentage of 25.

Frequency sampling procedures developed by Hyder et al. (1963) were used to supplement cover estimates on each macroplot. Although frequency data are difficult to interpret, the speed and objectivity inherent in the method makes them useful when comparing areas where high statistical precision is needed (Tueller, 1962). Ten frequency transects, each with 20 presence or absence determination quadrats of twenty 10- x 10-inch, 12- x 12-inch, or 30- x 30-inch quadrats were placed contiguously and moving away from the baseline. Only those plants rooted inside the frequency quadrats were recorded. A two-stage randomization was applied to these transects: (1) restricting five transects to each half of the macroplot, and (2) preventing transect overlap.

Dominance Rating

A complete species list was obtained at each study site and a dominance rating assigned to each species (Poulton, 1962).

5. The species which dominates the aspect of the layer. It is dominant in the sense of its impact on the microenvironment beneath its canopy. Only one 5 rating is given per layer in the stand.

4. The species which are co-dominant in the aspect of the layer. This is the species which shares dominance with another or which is subordinate only to the layer dominant which rates a 5. A layer may have one or more species rating a 4.

3. The species which are easily seen by standing in one place and looking casually around. These species are not outstanding in dominance. Most species in a stand fall in this category.

2. The species which can be seen only by moving around in the stand or by looking intently while standing in one place. Species occurring in patches encountered only by moving about, rate a 2. These species are not so rare that one must look in and around other plants to find them.

1. Species which can be seen only by searching for them in and around other plants. Considerable care is required to find species in a stand with a 1 rating.

Non-living Ground Cover. Non-living ground cover was determined by an adaptation of the point frame method as described by Goodall (1952). The same 200 frequency plots were used to sample cover but instead of recording presence of vegetation, the bottom tip end of the frequency frame was used as a point. Hits of bare ground, litter, pavement (1/4 to 1-inch diameter), rock (1-inch-plus diameter) and lichen cover, when present were recorded.

Constancy. Cain and Castro (1959) define constancy as "the percentage of occurrence of a species on samples of the same size in various stands of a community type."

Species constancy percentages were calculated for each macroplot. In order to develop a complete species list for constancy, each 100- x 100-square-foot macroplot was examined carefully after obtaining cover and frequency data. Additional species encountered were added to the list.

Topographic and Physiographic Features. Topographic features of each macroplot were characterized as follows: position on the slope whether top, upper one-third, center one-third, lower one-third, or bottom, slope in percent obtained from an abney level, and aspect from an 8-point compass.

Physiographic placement of each macroplot was characterized as follows: land form - drainage bottom, escarpment, fan, floodplain, plateau, flooded depression, ridge top, slope, lake-marine, or river terrace; macrorelief - flat, undulating, rolling, butte, hilly, or mountainous; microrelief - uniform-flat, convex, concave, interrupted-mount, pits, ridge and swale.

Soils Study - A soil profile description was made at each macroplot using the procedures outlined in the Soil Survey Manual (1951) and the Seventh Approximation (1960) plus revisions (1970). Horizons, soil color, texture, pH, lime content, structure and consistence were noted for each profile.

Lack of time and money prevented complete laboratory soil analyses. The following parameters were selected because they have been suggested to be indicative of vegetation and soil relationships (Eckert, 1957).

Samples from the A1 and B2 horizons were analyzed for conductivity (milimhos per centimeter), pH (from a saturated paste), and organic matter (percent). Cation exchange capacity (milliequivalents per 100 grams) was determined only on those samples from the A1 horizon. Cation exchange capacity is defined as the sum of the exchangeable cations of a soil. Conductivity is a measure of the soluble salts in a soil. pH is a measure of the acidity or alkalinity of a soil, or the concentration of H or OH ions, ranging from 0 to 14. Values above 7 are alkaline, below 7 are acid. Saline Soils. Conductivity is more than 4mmhos/cm, exchangeable-sodium-percentage is less than 15. Ordinarily, the pH is less than 8.5. Saline-Alkali Soils. Conductivity is greater than 4mmhos/cm and the exchangeable-sodium-percentage is greater than 15. The pH readings are seldom higher than 8.5. Nonsaline-Alkali Soils. Conductivity is less than 4mmhos/cm. And the exchangeable-sodium-percentage is greater than 15. The pH reading usually ranges between 9.5 and 10 (USDA Handbook No. 60, 1954).

Family level identifications were made as found in the Seventh Approximation (1960) and revisions (1970). When more than one profile description per family occurred, the modal description was used noting that family.

Each soil was classified as to hydrologic group (Nevada Dept. of Conservation and Natural Resources and the USDA, 1965); stoniness (USDA, 1951); and estimated water holding capacity based on clay mineralogy and texture (Schokley, 1955). Available water holding capacity was estimated for the rooting depth or to the depth of the soil profile studied if not otherwise stated. Rooting depths were limited by duripans and lithic or paralithic contacts.

Soil boundaries were not physically located and a soil map was not made. Thus detailed comparisons of soils across the boundary were not possible or within the scope of this study. Only the soils at the mcaroplots were described. The kinds of soils noted at the macroplots are commonly associated with the different kinds of vegetation in this watershed.

Erosion - Current erosion of each vegetation-soil unit was classified (USDA, 1964).

Climatic Data - Precipitation data were taken for a 5-year period from non-recording rain gages placed throughout the watershed. The data were then related to each applicable community in inches of annual precipitation.

Temperatures were estimated from existing records at Wells, located about 50 airline miles to the southwest. Wells has a climate similar to the lower elevations of the watershed.

KEY TO THE PLANT COMMUNITIES
in the
ROCK SPRINGS WATERSHED

B. Communities with a *Juniperus osteosperma* overstory.

C. *J. osteosperma* forming a closed community .....
J. osteosperma Community . . . . . (P. 49)

CC. *J. osteosperma* not forming a closed community.

D. *Artemisia nova* understory.

E. *A. nova* the most abundant plant in the understory .....*Juniperus osteosperma/Artemisia nova* Community. . . . . (P. 51)

EE. *Agropyron spicatum* abundant in the understory .....*Juniperus osteosperma/Artemisia nova/ Artemisia spicatum* Community . . . . . (P.53)

DD. *Artemisia tridentata* understory.

E. *Agropyron spicatum* abundant in the understory .....*Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* Community . . . . (P. 55)

EE. *Stipa comata* abundant in the understory..... *Juniperus osteosperma/Artemisia tridentata/Stipa comata* Community . . . . . (P. 57)

B. Communities with a *Populus tremuloides* overstory.

C. *Prunus virginiana* abundant in the understory..... *Populoides tremuloides/Prunus virginiana* Community . .(P. 59)

CC. *Poa nevadensis* and *Taraxacum officinale* abundant in the understory.....*Populus tremuloides/Poa nevadensis/Taraxacum officinale* Community . . . . . (P.61)

AA. Communities without a tree overstory

B. Communities with a shrub overstory

C. *Artemisia* overstory

D. *Artemisia tridentata* overstory

EE. *Symphoricarpos longiflorus* overstory.

F. *Artemisia tridentata* and *Amelanchier pallida* abundant in the shrub layer..... *Symphoricarpos longiflorus/Artemisia tridentata/Amelanchier pallida/Festuca idahoensis* Community. . . . . (P. 63)

FF. *Elymus cinereus* abundant grass.....*Symphoricarpos longiflorus/Elymus cinereus* Community . . . . . (P. 64)

BB. Communities without a shrub overstory. *Juncus balticus* dominant species.....*Juncus balticus/Poa nevadensis* Community. . . . . (P. 47)

Serviceberry *(Amelanchier pallida)* Community

1. *Amelanchier pallida/Artemisia tridentata/ Agropyron spicatum* Community

This community has developed in the southeast and west part of the watershed. The community occurs on north and east facing convex slopes of 21 to 29 percent, elevation ranges from 6200 to 6900 feet. The mean annual precipitation is 12.8 inches (Appendix A).

Serviceberry *(Amelanchier pallida)* and big sagebrush *(Artemisia tridentata)* are the most abundant shrubs with 11.3 and 8.2 percent cover, and 8.5 and 25.5 percent frequency, respectively. Longflower snowberry *(Symphoricarpos longiflorus)*, yellowbrush *(Chrysothamnus viscidiflorus)* and antelope bitterbrush *(Purshia tridentata)* occur with 15.8, 6.0 and 3.0 percent frequency, respectively. Additional shrubs are found with 0.5 to 1.2 percent frequency (Table 1).

The most abundant grasses are bluebunch wheatgrass *(Agropyron spicatum)* and Idaho fescue *(Festuca idahoensis)* (4.1 and 1.1 percent cover, and 48.5 and 31.4 percent frequency, respectively). Needle-and-thread *(Stipa comata)*, Sandberg bluegrass *(Poa secunda)*, cheatgrass *(Bromus tectorum)* and bottlebrush squirreltail *(Sitanion hystrix)* occur with frequency percents that range from 2.0 to 30.8. A number of additional grasses are found with frequency values less thant 2 percent.

Tailcup lupine *(Lupinus caudatus)*, bush birdbeak *(Cordylanthus ramosus)*, and tapertip onion *(Allium acuminatum)* are the most frequent forbs (28.0, 26.0 and 18.8 percent, respectively). A large number of additional forbs occur with frequency values that range from 0.5 to 9.2 percent. This community represents the *Amelanchier pallida/Artemisia tridentata/Agropyron spicatum* habitat-type.

Litter accounts for 74 percent of the non-living ground cover, pavement for 15 percent, bare ground for 8 percent, and rock for 3 percent (Table 2).

The soil at the macroplots where this community was sampled is a member of a loamy-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-31).

Table 3. Species Cover, Frequency, and Constancy for the *Artemisia arbuscula/Poa secunda* Community

Species	Cover	20 x 20* Frequency %	Constancy %
Artemisia arbuscula	18.2	64.0	100
Chrysothamnus viscidiflorus		8.3	100
Tetradymia canescens		2.0	100
Amelanchier pallida			67
Artemisia nova			33
Symphoricarpos longiflorus			33
Poa secunda			100
Agropyron spicatum			100
Sitanion hystrix			67
Stipa thurberiana			67
Festuca idahoensis			33
Carex sp.			33
Cordylanthus ramosus			100
Astragalus atratus			100
Erigeron linearis			67
Aster scopulorum			67
Astragalus purshii			100
Phlox diffusa			33
Eriogonum Heermannii			67
Lupinus caudatus			100
Phlox longifolia			67
Eriogonum andinum			67
Chaenactis douglasii			67
Comandra umbellata			67
Allium acuminatum			67
Castilleja Breweri			33
Arabis Holboelli			67
Crepis acuminata			67
Machaeronthara canescens			67
Astragalus lentiginosus			33
Balsamorhiza sagittata			33

*Frame size in inches.

Table 4. Non-living Ground Cover for the *Artemisia arbuscula/Poa secunda* Community

Material	Cover %
Bare ground	4.0
Litter	53.0
Pavement	27.0
Rock	16.0

Black Sagebrush *(Artemisia nova)* Communities

1. *Artemisia nova/Agropyron spicatum* Community

This community is found in the southern part of the watershed on north, east and west facing mountain slopes of 15 to 33 percent, elevation ranges from 6200 to 6400 feet. The mean annual precipitation is 11.5 inches (Appendix A).

Black sagebrush *(Artemisia nova)* is the dominant shrub with 13.0 percent cover and 61.5 percent frequency. Longflower snowberry *(Symphoricarpos longiflorus)* and yellowbrush *(Chrysothamnus viscidiflorus)* occur with 5.0 and 3.8 percent frequency. Additional shrubs are found in small amounts (Table 5).

Bluebunch wheatgrass *(Agropyron spicatum)* and Sandberg bluegrass *(Poa secunda)* are the most abundant grasses (5.5 and 2.5 percent cover, and 76.0 and 77.0 percent frequency, respectively). Idaho fescue *(Festuca idahoensis)* and bottlebrush squirreltail *(Sitanion hystrix)* occur in small amounts.

The most abundant forbs are *Phlox diffusa* and *Eriogonum asperuginas* with 47.5 and 13.0 percent frequency. A large number of additional forbs occur in small amounts. This community is representative of the *Artemisia nova/Agropyron spicatum* habitat-type.

Litter accounts for 48.8 percent of the non-living ground cover, rock for 23.4 percent, pavement for 21.3 percent and bare ground for 6.5 percent (Table 6).

The soils at the macroplot where this community was sampled are members of a coarse-loamy, mixed, frigid family of Xerollic Camborthids (Appendix B-4), and a clayey-skeletal, mixed, frigid family of Xerollic Haplargids (Appendix B-13).

Table 7. Species Cover and Frequency for the *Artemisia nova/ Sitanion hystrix* Community

Species	Cover %	20 x 20* Frequency %
Artemisia nova	10.0	34.5
Chrysothamnus viscidiflorus		30.0
Artemisia tridentata		12.0
Sitanion hystrix		12.0
Poa secunda		11.0
Oryzopsis hymenoides		3.5
Phlox diffusa		32.5
Erigeron pumilus		17.0
Astragalus purshii		6.5
Astragalus atratus		2.0
Cryptantha jamesii		1.5
Castilleja miniata		1.0
Eriogonum Heermannii		0.5
Eriogonum umbellatum		0.5

*Frame size in inches

Table 8. Non-living Ground Cover for the *Artemisia nova/ Sitanion hystrix* Community

Material	Cover %
Bare ground	20.0
Litter	36.5
Pavement	26.5
Rock	17.0

3. *Artemisia nova/Poa secunda* Community

This community has developed in the western part of the basin on south and west facing hills and mountains with 4 to 20 percent slope. The elevation ranges from 5900 to 6400 feet. The mean annual precipitation is 13.9 inches (Appendix A).

Black sagebrush *(Artemisia nova)* is the dominant species with 13.4 percent cover and 51.2 percent frequency. Yellowbrush *(Chrysothamnus viscidiflorus)* occurs with 16.7 percent frequency and antelope bitterbrush *(Purshia tridentata)* with 0.5 percent frequency (Table 9).

Sandberg bluegrass *(Poa secunda)* and bottlebrush squirrletail *(Sitanion hystrix)* are the most frequent grasses (47.7 and 20.7 percent, respectively). Thurbers needlegrass *(Stipa thurberiana)*, cheatgrass *(Bromus tectorum)* and bluebunch wheatgrass *(Agropyron spicatum)* occur with 16.7, 3.5 and 2.2 percent frequency, respectively. A few additional grasses are found in small quantities.

Phlox diffusa and sulfur eriogonum *(Eriogonum umbellatum)* are the most abundant forbs. A large number of additional forbs occur in small quantities. This community is probably a seral representative of an *Artemisia nova/Agropyron spicatum* habitat-type.

Pavement accounts for 45.5 percent of the non-living ground cover, litter for 28.3 percent, bare ground for 15.7 percent and rock for 10.5 percent (Table 10).

The soils at the macroplots where this community was sampled are members of a fine, mixed, frigid, shallow family of Xerollic Haplargids (Appendix B-11); loamy-skeletal, mixed, frigid family of Xerollic Haplargids (Appendix B-12); and fine, mixed frigid family of Xerollic Haplargids (Appendix B-18).

Table 9. Species Cover, Frequency, and Constancy for the *Artemisia nova/Poa secunda* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Artemisia nova	13.4	51.2	100
Chrysothamnus viscidiflorus		16.7	100
Purshia tridentata		0.5	33
Poa secunda		47.7	100
Sitanion hystrix		20.7	100
Stipa thurberiana		16.7	100
Bromus tectorum		3.5	33
Agropyron spicatum		2.2	100
Agropyron smithii			33
Oryzopsis hymenoides			33
Phlox diffusa		17.5	100
Eriogonum umbellatum		8.0	100
Phlox longifolia		5.5	67
Astragalus atratus		5.3	100
Allium acuminatum		5.2	100
Astragalus purshii		4.7	67
Eriastrum diffusum		4.7	67
Euphorbia lathyrus		3.8	33
Comandra umbellata		3.0	33
Aster scopulorum		2.7	67
Crepis acuminata		2.3	33
Chaenactis douglasii		1.5	67
Gayophytum ramosissimum		1.2	33
Opuntia polyacantha		1.0	67
Castilleja linariaefolia			67
Arabis Holboellii			33
Astragalus iodantus			33
Cordylanthus ramosus			33
Eriogonum Heermannii			33
Eriogonum andinum			33
Lygodesmia spinosa			33
Oenothera caespitosa			33

*Frame size in inches

Table 10. Non-living Ground Cover for the *Artemisia nova/Poa secunda* Community

Material	Cover %
Bare ground	15.7
Litter	28.3
Pavement	45.5
Rock	10.5

Big Sagebrush *(Artemisia tridentata)* Communities

1. *Artemisia tridentata/Agropyron cristatum* Community

This community occurs in the southern part of the basin on fans and drainage bottoms with 1 to 2 percent slope. The elevation ranges from 5100 to 5200 feet, and the mean annual precipitation is 10.3 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* is the most abundant shrub with 1.8 percent cover and 15.2 percent frequency. Yellowbrush *(Chrysothamnus viscidiflorus)* and black greasewood *(Sacobatus vermiculatus)* occur with frequency values of 9.8 and 2.0 percent, respectively (Table 11).

Fairway wheatgrass *(Agropyron cristatum)* is found with 3.4 percent cover and 28.8 percent frequency. Cheatgrass *(Bromus tectorum)*, Indian ricegrass *(Oryzopsis hymenoides)*, bottlebrush squirreltail *(Sitanion hystrix)*, needle-and-threadgrass *(Stipa comata)*, western wheatgrass *(Agropyron smithii)* and Sandberg bluegrass *(Poa secunda)* are found with small frequency values.

Annual stickseed *(Lappula redowskii)* and *Eriastrum diffusum* are the most frequent forbs with 2.0 and 1.8 percent, respectively. Additional species occur in small amounts. This community is probably one of the following habitat-types: *A. tridentata/Stipa comata; A. tridentata/Stipa thurberiana;* or *Poa nevadensis/Carex* sp.

Litter accounts for 55.4 percent of the non-living ground cover, bare ground for 38.8 percent, pavement for 5.3 percent, and rock for 0.5 percent (Table 12).

The soils at the macroplot where this community was described are members of a coarse-loamy, mixed, frigid family of Durixerollic Camborthids (Appendix B-8), and fine-loamy, mixed, frigid family of Xerollic Duragids (Appendix B-21).

Table 11. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Agropyron cristatum* Community

Species	Cover %	30 x 30* Frequency %	Constancy %
Artemisia tridentata	1.8	15.7	67
Chrysothamnus viscidiflorus		9.8	67
Sarcobatus vermiculatus		2.0	33
Agropyron cristatum	3.4	28.8	100
Bromus tectorum		25.2	67
Oryzopsis hymenoides		7.5	67
Sitanion hystrix		5.8	100
Stipa comata		2.7	33
Agropyron smithii		1.3	67
Poa secunda		0.5	67
Lappula redowskii		2.0	33
Eriastrum diffusum		1.8	33
Mentzelia albicaulis		1.3	67
Arenaria kingii		1.0	33
Achillea lanulosa			33
Astragalus iodantus			33
Astragalus lentiginosus			33
Chaenactis douglasii			33
Collinsia parviflora			33
Halogeton glomeratus			33
Machaeranthara canescens			33
Oenothera caespitosa			33
Opuntia polyacantha			33

*Framesize in inches

Table 12. Non-living Ground Cover for the *Artemisia tridentata/ Agropyron cristatum* Community

Material	Cover%
Bare gound	38.8
Litter	55.4
Pavement	5.3
Rock	0.5

2. *Artemisia tridentata/Agropyron smithii* Community

This community is found in the western part of the watershed on south and southeast facing drainage bottoms with 1 to 5 percent slope and on a few west facing fans with 3 percent slope. Elevation ranges from 6000 to 6300 feet, and the mean annual percipitation is 9.8 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* is the dominant species in this community (26.6 percent cover and 39.0 percent frequency). Yellowbrush *(Chrysothamnus viscidiflorus)* is found with 2.6 percent cover and 17.0 percent frequency. A few additional shrubs are found throughout the community in small amounts (Table 13).

Western wheatgrass *(Agropyron smithii)* is the most frequent grass (18.5 percent). Sandberg bluegrass *(Poa secunda)*, mat muhly *(Muhlenbergia richardsonis)*, Nevada bluegrass *(Poa nevadensis)* occur with frequency values of 16.8, 12.5, 12.0 percent, respectively. A few additional grasses are found with small frequency percents. Sedge *(Carex* sp.*)* occurs with 0.9 percent cover and 42.2 percent frequency.

Aster adscendens and littleflower collinsia *(Collinsia parviflora)* are the most abundant forbs with 25.5 and 24.0 percent frequency. A large number of additional forbs are found in small quantities. The community is a seral representative of a *Poa nevadensis/Carex* sp. habitat-type.

Litter accounts for 85.5 percent of the non-living ground cover, bare ground for 11.3 percent, pavement for 2.2 percent and rock for 1.0 percent (Table 14).

The soils at the macroplot where this community was sampled are members of a coarse-loamy, mixed, frigid family of Fluventic Haplustolls (Appendix B-25); fine, mixed, frigid family of Pachic Argiustolls (Appendix B-27); and fine, mixed, frigid family of Typic Argixerolls (Appendix B-33).

Table 13. Species Cover and Frequency for the *Artemisia tridentata/Agropyron smithii* Community

Species	Cover %	20 x 20* Frequency %
Artemisia tridentata	26.6	39.0
Chrysothamnus viscidiflorus	2.6	17.0
Chrysothamnus nauseosus		1.5
Symphoricarpos longiflorus		1.5
Purshia tridentata		0.1
Agropyron smithii		18.5
Poa secunda		16.8
Muhlenbergia richardsonis		12.5
Poa nevadensis		12.0
Sitanion hystrix		2.0
Bromus tectorum		1.2
Carex sp.	0.9	42.2
Aster adscendens		24.5
Collinsia parviflora		24.0
Descurainia sophia		7.2
Phlox longifolia		7.0
Lupinus caudatus		5.0
Arabis Holboelli		4.5
Taraxacum officinale		4.2
Gayophytum ramosissimum		3.5
Iva axillaris		3.5
Achillea lanulosa		2.2
Sisymbrium linifolium		1.5
Eriogonum umbellatum		1.0
Astragalus sp.		
Astragalus purshia		
Chenopodium album		
Chenopodium leptophyllum		
Comandra umbellata		
Iris missouriensis		
Lappula redewskii		

*Frame size in inches

Table 14. Non-living Ground Cover for the *Artemisia tridentata/Agropyron smithii* Community

Material	Cover %
Bare ground	11.3
Litter	85.5
Pavement	2.2
Rock	1.0

3. *Artemisia tridentata/Agropyron smithii/Poa nevadensis* Community

This community is found in the southeast and western part of the watershed on north, northeast and east facing fans of 1 to 4 percent. The elevation ranges from 5425 to 6100 feet, and the mean annual precipitation is 10.1 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* and yellowbrush *(Chrysothamnus viscidiflorus)* are the most abundant shrubs (15.2 and 4.5 percent cover, and 38.8 and 23.3 percent frequency, respectively). Rubber rabbitbrush *(Chrysothamnus nauseosus)* occurs with 33 percent frequency (Table 15).

Nevada bluegrass *(Poa nevadensis)* and western wheatgrass *(Agropyron smithii)* occur with 1.1 and 0.7 percent cover, and 22.3 and 42.0 percent frequency, respectively. A number of additional grasses are found with frequency values that range from 0 to 27.7 percent. *Carex* sp. is found with 33 percent constancy.

Bush birdbeak *(Cordylanthus ramosus)*, tapertip onion *(Allium acuminatum)*, and longleaf phlox *(Phlox longifolia)* are the most frequent forbs (9.5, 7.2 and 6.6 percent, respectively). A large number of forbs occur in small quantities. This community is probably an *Artemisia tridentata/Stipa thurberiana* habitat-type.

Litter accounts for 45.9 percent of the non-living ground cover, bare ground for 32.5 percent and pavement for 21.6 percent (Table 16).

The soil at the macroplot where this community was sampled ia a member of a fine, mixed, frigid family of Xerollic Haplargids (Appendix B-15).

Table 15. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Agropyron smithii/Poa nevadensis* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Artemisia tridentata	15.2	38.8	100
Chrysothamnus viscidiflorus	4.5	23.3	100
Chrysothamnus nauseosus			33
Poa nevadensis	1.1	22.3	100
Agropyron smithii	0.7	42.0	100
Stipa thurberiana	0.3	8.2	67
Poa secunda		27.7	100
Sitanion hystrix		20.7	100
Agropyron cristatum			33
Agropyron spicatum			33
Bromus tectorum			33
Carex sp.			33
Cordylanthus ramosus		9.5	33
Allium acuminatum		7.2	67
Phlox longifolia		6.6	100
Gayophytum ramossissimum		5.7	100
Leptodactylon pungens		3.7	100
Astragalus purshii		3.2	67
Arabis kingii		2.5	67
Lappula redowskii		2.5	67
Arabis Holboellii		2.3	100
Antennaria dimorpha		2.0	33
Astragalus atratus		2.0	33
Eriastrum diffusum		2.0	67
Delphinium Andersonii		1.8	67
Astragalus iodantus		1.3	33
Comandra umbellata		1.3	33
Eriogonum umbellatum		1.3	100
Sisymbrium linifolium		1.2	67
Astragalus lentiginosus		1.0	67
Lupinus caudatus		1.0	33
Aster scopulorum			33
Chaenactis douglasii			33
Collinsia parviflora			33
Cryptantha jamesii			33
Eriogonum Heermannii			33
Opuntia polyacantha			33
Phlox diffusa			33

*Frame size in inches

Table 16. Non-living Ground Cover for the *Artemisia tridentata/Agropyron smithii/Poa nevadensis* Community

Material	Cover %
Bare ground	32.5
Litter	45.9
Pavement	21.6
Rock	0.0

4. *Artemisia tridentata/Chrysothamnus nauseosus* Community

This community has developed in the southern part of the watershed on southwest and east facing drainage bottoms with 1 percent slope. Elevation ranges from 5225 to 5400 feet, and the mean annual precipitation is 10.3 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* and rubber rabbitbrush *(Chrysothamnus nauseosus)* are co-dominant species with 16.1 and 14.4 percent cover, and 14.4 and 51.5 percent frequency, respectively. Black greasewood *(Sarcobatus vermiculatus)* and Gardner saltbrush *(Atriplex gardneri)* are found in small quantities (Table 17).

Western wheatgrass *(Agropyron smithii)* is the most frequent grass (13.6 percent). Nevada bluegrass *(Poa nevadensis)*, bottlebrush squirreltail *(Sitanion hystrix)*, cheatgrass *(Bromus tectorum)*, Great Basin wildrye *(Elynus cinereus)* occur with small frequency values.

Baltic rush *(Juncus balticus)* and *Carex* sp. are found with 4.1 and 1.1 percent frequency, respectively. The most abundant forb is flixweed tansymustard *(Descurainia sophia)* with 17.8 percent frequency. A few additional forbs are found with small frequency values. This community is probably a seral respresentative of an *Artemisia tridentata/Elynus cinereus* habitat-type.

Litter accounts for 71.3 percent of the non-living ground cover, bare ground for 27.8 percent rock for 0.6 percent, and pavement for 0.3 percent (Table 18).

The soil at the macroplot where this community was sampled is a member of a fine-loamy, mixed frigid family of Fluventic Haplustolls (Appendix B-26).

Table 17. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Chrysothamnus nauseosus* Community.

Species	Cover %	30 x 30* Frequency %	Constancy %
Artemisia tridentata	16.1	47.1	100
Chrysothamnus nauseosus	14.4	51.1	100
Sarcobatus vermiculatus	1.9	12.2	50
Atriplex gardneri			25
Agropyron smithii		13.6	75
Poa nevadensis		9.6	75
Sitanion hystrix		9.1	100
Bromus tectorum		2.1	25
Elymus cinereus		2.0	75
Agropyron cristatum			25
Juncus balticus		4.1	25
Carex sp.		1.1	25
Descurainia sophia		17.8	50
Sisymbrium linifolium		6.0	50
Iva axillaris		3.9	25
Lomatium spp.		2.6	25
Chenopodium leptophyllum		2.0	50
Lappula redowskii		1.6	50
Halogeton glomeratus			50
Astragalus iodantus			25
Astragalus lentiginosus			25
Chenopodium album			25
Gayophytum ramosissimum			25
Salsola kali var. *tenuifolia*			25

*Frame size in inches

Table 18. Non-living Ground Cover for the *Artemisia tridentata/Chrysothamnus nauseosus* Community

Material	Cover %
Bare ground	27.8
Litter	71.3
Pavement	0.3
Rock	0.6

5. *Artemisia tridentata/Chrysothamnus viscidiflorus/ Poa secunda* Community

This community occurs in most parts of the basin mostly on east and south facing terraces with 3 to 25 percent slope. Elevation ranges from 5800 to 6700 feet, and the mean annual precipitation is 10.1 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* and yellowbrush *(Chrysothamnus viscidiflorus)* are found with 18.0 and 6.0 percent cover, and 43.5 and 22.5 percent frequency, respectively (Table 19).

Sandberg bluegrass *(Poa secunda)* and bluebunch wheatgrass *(Agropyron spicatum)* are the most abundant grasses with 2.0 and 1.2 percent cover, and 39.5 and 21.0 percent frequency, respectively. Bottlebrush squirreltail *(Sitanion hystrix)* and Great Basin wildrye *(Elymus cinereus)* occur with 23.5 and 0.5 percent frequency.

Phlox diffusa and tapertip onion *(Allium acuminatum)* are the most frequent forbs (23.0 and 16.5 percent, respectively). Additional forbs occur with small frequencies. This community is a seral representative of an *Artemisia tridentata/Agropyron spicatum* habitat-type.

Litter accounts for 57.0 percent of the non-living ground cover, pavement and bare ground each account for 22.0 and 18.0 percent, and rock for 3.0 percent (Table 20).

The soils at the macroplot where this community was sampled are members of a fine, mixed, frigid family of Xerollic Duragids (Appendix B-22); and fine, mixed, frigid, shallow family of Typic Argixerolls (Appendix B-30).

Table 21. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/ Sitanion hystrix* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Artemisia tridentata	17.2	41.7	100
Chrysothamnus viscidiflorus	0.1	9.7	100
Sitanion hystrix	1.8	37.5	100
Poa secunda	0.9	16.0	100
Stipa thurberiana	0.3	3.7	33
Agropyron smithii		17.0	67
Eriastrum diffusum		11.8	67
Phlox diffusa		9.8	67
Phlox longifolia		9.0	100
Allium acuminatum		8.3	67
Aster scopulorum		7.8	33
Astragalus atratus		7.3	67
Delphinium Andersonii		5.8	67
Erigeron pumilus		4.0	33
Gayophytum ramosissimum		2.7	67
Astragalus iodantus		2.0	67
Astragalus purshii		1.3	33
Leptodactylon pungens		1.0	67
Eriogonum umbellatum			67
Cordylanthus ramosus			67
Opuntia polyacantha			33
Arabis Holboellii			33
Astragalus lentiginosus			33
Chaenactis douglasii			33
Crepis acuminata			33
Cryptantha jamesii			33
Lappula redowskii			33
Oenothera caesiptosa			33

*Frame size in inches

Table 22. Non-living Ground Cover for the *Artemisia tridentata/Sitanion hystrix* Community

Material	Cover %
Bare ground	17.6
Litter	48.2
Pavement	34.1
Rock	0.1

7. *Artemisia tridentata/Stipa comata* Community

This community has developed mostly in the northeast part of the watershed on northeast and south facing fans with 1 to 9 percent slope. Elevation ranges from 5400 to 5600 feet, and the mean annual precipitation is 10.7 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* and yellowbrush *(Chrysothamnus viscidiflorus)* occur with 14.8 and 1.8 percent cover, and 26.8 and 14.8 percent frequency. A few additional shrubs are found with small frequency values (Table 23).

Needle-and-threadgrass *(Stipa comata)* is the most abundant grass (7.1 percent cover and 72.3 percent frequency). Bottlebrush squirreltail *(Sitanion hystrix)* and western wheatgrass *(Agropyron smithii)* occur with 35.5 and 27.9 percent frequency. A number of additional grasses are present in small quantities. *Carex* sp. occurs with 4.6 percent frequency.

Groundsmoke *(Gayophytum ramosissimum)* and James cryptantha *(Cryptantha jamesii)* are the most frequent forbs (24.5 and 16.0 percent). Other forbs are found with small quantities. This community is a representative of the *Artemisia tridentata/Stipa comata* habitat-type.

Litter accounts for 53.6 percent of the non-living ground cover, bare ground for 38.2 percent, pavement for 7.2 and rock for 1.0 percent (Table 24).

The soil at the macroplots where this community was sampled is a member of a sandy, mixed, frigid family of Typic Torrisamments (Appendix B-1)

Table 23. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Stipa comata* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Artemisia tridentata	14.8	26.8	100
Chrysothamnus viscidiflorus	1.8	14.8	100
Leptodactylon pungens		6.4	80
Chrysothamnus nauseosus		6.0	60
Opuntia polyacantha		0.5	60
Stipa comata	7.1	72.3	100
Sitanion hystrix		35.5	100
Agropyron smithii		27.9	100
Poa secunda		16.2	100
Poa nevadensis		14.0	80
Oryzopsis hymenoides		9.3	100
Stipa thurberiana		0.6	20
Carex sp.		4.6	80
Gayophytum ramosissimum		24.5	100
Cryptantha jamesii		16.0	80
Eriastrum diffusum		14.3	100
Phlox longifolia		8.0	80
Eriogonum umbellatum		6.6	100
Eriogonum microthecum		4.3	40
Phlox diffusa		2.2	40
Delphinium Andersonii		1.6	100
Astragalus sp.		1.5	60
Chaenactis douglasii		1.5	60
Astragalus purshii		0.6	20

*Frame size in inches

Table 24. Non-living Ground Cover for the *Artemisia tridentata/Stipa comata* Community

Material	Cover %
Bare ground	38.2
Litter	53.6
Pavement	7.2
Rock	1.0

8. *Artemisia tridentata/Stipa comata Agropyron smithii* Community

This community is encountered in most parts of the watershed on all aspects with 1 to 15 percent slope. Elevation ranges from 5300 to 5800 feet, and the mean annual precipitation is 10.9 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* and yellowbrush *(Chrysothamnus viscidiflorus)* occur with 14.8 and 1.0 percent cover, and 34.2 and 8.3 percent frequency, respectively (Table 25).

Needle-and-threadgrass *(Stipa comata)* and western wheatgrass *(Agropyron smithii)* are the most abundant grasses (2.4 and 1.3 percent cover, and 44.0 and 40.1 percent frequency, respectively). A variety of additional grasses are found in small amounts.

The most frequent forbs are groundsmoke *(Gayophytum ramosissimum)* and *Eriastrum diffusum* (1.2 and 10.2 percent). A number of additional plants are found in small quantities. This community is a representative of an *Artemisia tridentata/Stipa comata* habitat-type.

Litter accounts for 66.6 percent of the non-living ground cover, bare ground for 27.1 percent, pavement for 5.5 percent, and rock for 0.8 percent (Table 26).

The soil at the macroplots where this community was sampled is a member of a sandy, mixed, frigid family of Typic Torrisamments (Appendix B-1).

Table 25. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Stipa comata/Agropyron smithii* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Artemisia tridentata	14.8	34.2	100
Chrysothmnus viscidiflorus	1.0	8.3	100
Stipa comata	2.4	44.0	100
Agropyron smithii	1.3	40.1	100
Poa secunda		19.5	100
Sitanion hystrix		15.4	100
Oryzopsis hymenoides		5.5	80
Stipa thurberiana		1.5	40
Poa nevadensis			80
Bromus tectorum			40
Agropyron cristatum			20
Gayophytum ramosissimum		11.2	80
Eriastrum diffusum		10.2	60
Eriogonum umbellatum		4.6	100
Cryptantha jamesii		2.7	60
Phlox diffusa		2.4	60
Phlox longifolia		1.8	40
Eriogonum deflexum		1.7	20
Arabis Hoboellii		1.6	60
Astragalus sp.		1.0	40
Opuntia polyacantha			80
Allium acuminata			40
Astragalus purshii			40
Zigadenus paniculatus			40
Astragalus lentiginosus			20
Chaenactis douglasii			20
Chenopodium leptophyllum			20
Delphinium Andersonii			20
Machaeranthara canescens			20
Lappula redowski			20
Leptodactylon pungens			20

*Frame in inches

Table 26. Non-living Ground Cover for the *Artemisia tridentata/Stipa comata/Agropyron smithii* Community

Material	Cover %
Bare ground	27.1
Litter	66.6
Pavement	5.5
Rock	0.8

9. *Artemisia tridentata/Stipa thurberiana* Community

This community has developed in the western part of the basin on north, east and southeast facing fans of 3 to 5 percent slope. Elevation ranges from 5900 to 6100 feet. The mean annual precipitation is 9.9 inches (Appendix A).

The shrubs found in this community are big sagebrush *(Artemisia tridentata)* and yellowbrush *(Chrysothamnus viscidiflorus)* (15.0 and 3.6 percent cover, and 28.2 and 18.8 percent frequency) (Table 27).

Thurber needlegrass *(Stipa thurberiana)* is the most abundant grass with 2.6 percent cover and 26.7 percent frequency. Sandberg bluegrass *(Poa secunda)*, western wheatgrass *(Agropyron smithii)* and bottlebrush squirreltail *(Sitanion hystrix)* occur with 33.7, 18.7 and 18.2 percent frequency, respectively. A few additional grasses are found in small amounts.

A large number of forbs are found, of which longleaf phlox *(Phlox longifolia)* and Crag aster *(Aster scopulorum)* are the most frequent (20.7 and 13.5 percent). This community is a representative of an *Artemisia tridentata/Stipa thurberiana* habitat-type.

Litter accounts for 59.8 percent of the non-living ground cover, bare ground for 22.6 percent, pavement for 16.0 percent and rock for 1.6 percent (Table 28).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, frigid family of Xerollic Camborthids (Appendix B-3); and a very-fine, mixed, frigid family of Xerollic Haplargids (Appendix B-19).

Table 27. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Stipa thurberiana* Community

Species	Cover %	20 x 20* Frequency	Constancy %
Artemisia tridentata	15.0	28.2	100
Chrysothamnus viscidiflorus	3.6	18.8	100
Stipa thurberiana	2.6	26.7	100
Poa secunda		33.7	100
Agropyron smithii		18.7	100
Sitanion hystrix		18.2	100
Agropyron spicatum		4.5	67
Stipa comata		4.8	33
Poa nevadensis		4.3	67
Bromus tectorum			67
Phlox longifolia		20.7	100
Aster scopulorum		13.5	67
Allium acuminatum		11.0	100
Eriastrum diffusum		10.0	100
Cordylanthus ramosus		9.8	67
Astragalus atratus		8.3	67
Gayophytum ramosissimum		8.3	67
Delphinium Andersonii		5.3	100
Eriogonum umbellatum var. *aridum*		5.0	67
Astragalus purshii		2.8	67
Eriogonum Heermannii		2.7	67
Leptodactylon pungens		2.0	67
Comandra umbellata		1.8	33
Astragalus iodanthus		1.2	67
Arabis Holboellii			33
Astragalus lentiginosus			33
Collinsia parviflora			33
Crepis acuminata			33
Phlox diffusa			33
Zigadenus paniculatus			33

*Frame size in inches

Table 28. Non-living Ground Cover for the *Artemisia tridentata/Stipa thurberiana* Community

Material	Cover %
Bare ground	22.6
Litter	59.8
Pavement	16.0
Rock	1.6

10. *Artemisia tridentata/Symphoricarpos longiflorus/ Agropyron spicatum* Community

This community has developed in the western part of the watershed on east facing mountains with 10 to 20 percent slope, and south facing ridges with 5 percent slope. Elevation ranges from 6600 to 7300 feet, and the mean annual precipitation is 13.9 inches (Appendix A).

Big sagebrush *(Artemisia tridentata)* and longflower snowberry *(Symphoricarpos longiflorus)* are co-dominant species (16.3 and 15.6 percent cover, and 18.5 and 16.7 percent frequency, respectively). Yellowbrush *(Chrysothamnus viscidiflorus)* and serviceberry *(Amelanchier pallida)* are found with 25.6 and 0.5 percent frequency.

Bluebunch wheatgrass *(Agropyron spicatum)* and Idaho fescue *(Festuca idahoensis)* are the most abundant grasses with 2.0 and 1.0 percent cover, and 42.0 and 25.5 percent frequency, respectively. A large number of grasses are found with frequency percents of 0.5 to 19.7. *Carex* sp. occurs with 1.5 percent cover.

The most abundant forbs are tailcup lupine *(Lupinus caudatus)* and bigflower collomia *(Collomia grandifolia)* with 44.3 and 20.0 percent frequency, respectively. Additional forbs are found with low frequency values. This community is a representative of an *Artemisia tridentata/Symphoricarpos longiflorus/Agropyron spicatum* habitat-type.

Litter accounts for 97.0 percent of the non-living ground cover, bare ground for 2.8 percent and pavement for 0.2 percent (Table 30).

The soils at the macroplots where this community was sampled are members of a coarse-loamy, mixed, frigid family of Cumulic Haploxerolls (Appendix B-28); and fine, mixed, frigid family of Typic Argixerolls (Appendix B-33)

Table 29. Species Cover, Frequency, and Constancy for the *Artemisia tridentata/Symphoricarpus longiflorus/Agropyron spicatum* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Artemisia tridentata	16.3	18.5	100
Symphoricarpus longiflorus	15.6	16.2	100
Chrysothamnus viscidiflorus	0.9	25.6	100
Amelanchier pallida		0.5	33
Agropyron spicatum	2.0	42.0	100
Festuca idahoensis	1.0	25.5	100
Bromus tectorum		19.7	67
Poa secunda		12.3	100
Stipa columbiana		12.0	67
Elymus cinereus		5.5	67
Melica bulbosa		3.0	67
Poa nevadensis		1.3	100
Agropyron smithii		0.5	33
Agropyron trachycaulum		0.5	33
Poa cusickii		0.5	33
Stipa lettermani		0.5	33
Carex sp.		1.5	33
Lupinus caudatus		44.3	100
Collomia grandiflora		20.0	67
Eriogonum asperuginas		11.4	67
Commandra pallida		10.5	67
Balsamorhiza sagittata		6.3	67
Achillea lanulosa		3.2	67
Chenopodium leptophyllum		2.2	67
Senecio integerrimus		1.8	67
Rosa woodsii		1.0	33
Arabis Holboellii			33
Cirsium vulgare			33
Comandra umbellata			33
Crepis acuminata			33
Descurainia sophia			33
Eriogonum Heermannii			33
Gayophytum ramosissimum			33
Geranium richardsoni			33
Penstemon kingii			33
Taraxacum officinale			33

*Frame size in inches

Table 30. Non-living Ground Cover for the *Artemisia tridentata/Symphocarpus longiflorus/Agropyron spicatum* Community

Material	Cover %
Bare ground	2.8
Litter	97.0
Pavement	0.2
Rock	0.0

Rubber Rabbitbrush *(Chrysothamnus nauseosus)* Community

1. *Chrysothamnus nauseosus* Community

This community occurs in the main drainage at the southern part of the watershed on 1 percent south and east facing slopes. Elevation ranges from 5125 to 5300 feet, and the mean annual precipitation is 10.3 inches (Appendix A).

Rubber rabbitbrush *(Chrysothamnus nauseosus)* is the dominant plant with 32.0 percent cover and 67.5 percent frequency. Black greasewood *(Sarcobatus vermiculatus)*, yellowbrush *(Chrysothamnus viscidiflorus)* and big sagebrush *(Artemisia tridentata)* occur with 17.2, 25.8 and 11.8 percent frequency, respectively.

Western wheatgrass *(Agropyron smithii)*, bottlebrush squirreltail *(Sitanion hystrix)* and Great Basin wildrye *(Elymus cinereus)* are the most frequent grasses (12.0, 4.5 and 2.5 percent, respectively), with cheatgrass *(Bromus tectorum)*, Nevada bluegrass *(Poa nevadensis)* and Sandberg bluegrass *(Poa secunda)* found in small quantities.

Timber poisonvetch *(Astragalus convallarius)* is the most frequent forb with 13.0 percent. Additional forbs occur with small frequency values. This community is probably a seral representative of an *Artemisia tridentata/Elymus cinereus* habitat-type.

Litter accounts for 65.5 percent of the non-living ground cover, bare ground for 34.0 percent, pavement for 0.5 percent (Table 32).

The soil at the macroplots where this community was sampled is a member of a coarse-loamy, mixed frigid family of Xerollic Camborthids (Appendix B-5).

Table 31. Species Cover and Frequency for the *Chrysothamus nauseosus* Community

Species	Cover %	20 x 20* Frequency %
Chrysothamnus nauseosus	32.0	67.5
Sarcobatus vermiculatus	5.0	17.2
Chrysothamnus viscidiflorus		25.8
Artemisia tridentata		11.8
Agropyron smithii		12.0
Sitanion hystrix		4.5
Elymus cinereus		2.5
Bromus tectorum		
Poa nevadensis		
Poa secunda		
Astragalus convallaris		13.0
Descurainia sophia		4.8
Sisymbrium linifolium		4.8
Asgragalus lentiginosus		0.5
Chenopodium leptophyllum		0.5
Erigeron asperugineus		0.5
Chenopodium album		0.5
Halogeton glomeratus		0.5

*Frame size in inches

Table 32. Non-living Ground Cover for the *Chrysothamnus nauseosus* Community

Material	Cover %
Bare ground	34.0
Litter	65.5
Pavement	0.5
Rock	0.0

Yellowbrush *(Chrysothamnus viscidiflorus)* Community

1. *Chrysothamnus viscidiflorus/Stipa comata* Community

This community has resulted from burning in the *Artemisia tridentata/Stipa comata* community in the northern part of the watershed. This small seral community occurs on west facing fans with 2 percent slope. The elevation is 5500 feet, and the mean annual precipitation is 10.7 inches (Appendix A).

Yellowbrush *(Chrysothamnus viscidiflorus)* is the dominant shrub with 4.0 percent cover and 8.0 percent frequency (Table 33).

Needle-and-threadgrass *(Stipa comata)* is the most abundant species with 13.0 percent cover and 68.0 percent frequency. Western wheatgrass *(Agropyron smithii)* occurs with 22.5 percent frequency. Additional grasses are found with small frequency values. *Carex* sp. occurs with 12.0 percent cover.

Eriastrum diffusum, groundsmoke *(Gaylophytum ramosissimum)* and annual stickseed *(Lappula redowskii)* are found with 57.0, 46.0 and 42.0 percent frequency, respectively. A few additional forbs are found in small quantities. This community is a seral representative of an *Artemisia tridentata/Stipa comata* habitat-type.

Litter accounts for 70.0 percent of the non-living ground cover and bare ground for 30.0 percent (Table 34).

The soil at the macroplots where this community was sampled is a member of a sandy, mixed, frigid family of Typic Torrisamments (Appendix B-1).

Table 33. Species Cover and Frequency for the *Chrysothamnus viscidiflorus/Stipa comata* Community

Species	Cover %	20 x 20* Frequency %
Chrysothamnus viscidiflorus	4.0	8.0
Stipa comata	13.0	68.0
Agropyron smithii		22.5
Poa nevadensis		3.0
Oryzopsis hymenoides		2.0
Stipa thurberiana		1.5
Sitanion hystrix		1.0
Carex sp.		12.0
Eriastrum diffusum		57.0
Gayophytum ramosissimum		46.0
Lappula redowskii		42.0
Astragalus lentiginosus		6.5
Mentzelia albicaulis		5.5
Delphinium Andersonii		1.0
Descurainia sophia		1.0

*Frame size in inches

Table 34. Non-living Ground Cover for the *Chrysothamnus viscidiflorus/Stipa comata* Community

Material	Cover %
Bare ground	30.0
Litter	70.0
Pavement	0.0
Rock	0.0

Baltic Rush *(Juncus balticus)* Community

1. *Juncus balticus/Poa nevadensis* Community

This community occurs mostly in the western part of the watershed on southeast facing drainage bottoms with 2 percent slope. The elevation is 6000 feet and the mean annual precipitation is 14.0 inches (Appendix A).

Woods rose *(Rosa woodsii)* occurs with 1.0 percent cover (Table 35).

Nevada bluegrass *(Poa nevadensis)*, California barley *(Hordeum californicus)* and timothy *(Phleum pratense)* are found with 10.5, 4.0 and 3.5 percent cover, respectively.

The most abundant species is baltic rush *(Juncus balticus)* with 34.5 percent cover. *Juncus* sp. and *Carex* sp. occur with 15.0 and 0.5 percent cover. Rocky Mountain iris *(Iris missouriensis)* occurs with 10.0 percent cover, and other forbs are found with small cover percentages. This community is a seral representative of the *Poa nevadensis/Carex* sp. habitat-type.

Bare ground occurs with 6.0 percent cover, litter with 4.5 percent and rock with 0.5 percent.

The soil at the macroplot where this community was sampled is a member of a fine, mixed, frigid family of Cumulic Hapaqualls (Appendix B-24).

Table 35. Species Cover for the *Juncus balticus/Poa nevadensis* Community.

Species	Cover %*
Rosa woodsii	1.0
Poa nevandensis	10.5
Hordeum californicum	
Phleum pratense	
Juncus balticus	34.5
Juncus sp.	15.0
Carex sp.	0.5
Iris missouriensis	10.0
Mimulus sp.	2.0
Taraxacum officinale	1.5
Lappula redowskii	0.5
Machaeranthera canescens	0.5
Ranunculus cymbalaria	0.5
Achillea lanulosa	
Rumex sp.	
Litter	4.5
Bare ground	6.0
Rock	0.5

*Point frame

Utah Juniper *(Juniperus osteosperma)* Communit

1. *Juniperus osteosperma* Community

This community has developed in the east central part of the watershed on south facing slopes of 29 to 50 percent. Elevation ranges from 5300 to 5400 feet, and the mean annual precipitation is 10.1 inches (Appendix A).

Utah juniper *(Juniperus osteosperma)* is the dominant species with 19.8 percent cover. A few shrubs are found in the community with yellowbrush *(Chrysothamnus viscidiflorus)* the most frequent (1.5 percent) (Table 36).

Indian ricegrass *(Oryzopsis hymenoides)*, Sandberg bluegrass *(Poa secunda)*, Thurber needlegrass *(Stipa thurberiana)*, bottlebrush squirreltail *(Sitanion hystrix)* and bluebunch wheatgrass *(Agropyron spicatum)* occur with 6.5, 5.4, 4.4, 4.0 and 3.8 percent frequency.

Tufted evening-primrose *(Oenothera caespitosa)* is the most frequent forb (4.9 percent) with a number of additional forbs scattered through the community in small amounts. This community is a representative of the *Juniperus osteosperma* habitat-type.

Pavement accounts for 31.7 percent of the non-living ground cover, bare ground for 24.3 percent, rock for 22.9 percent, and litter for 21.1 percent (Table 37).

The soils at the macroplots where this community was sampled is a member of a sandy, mixed, frigid, shallow family of Typic Xerorthents (Appendix B-2), and a fine-skeletal, mixed, frigid, shallow family of Xerollic Haplargids (Appendix B-10).

Table 36. Species Cover, Frequency, and Constancy for the *Juniperus osteosperma* Community

Species	Cover %	30 x 30* Frequency %	Constancy %
Juniperus osteosperma	19.8		
Chrysothamnus viscidiflorus		1.5	60
Artemisia tridentata			60
Grayia spinosa			20
Purshia tridentata			20
Oryzopsis hymenoides		6.5	100
Poa secunda		5.4	80
Stipa thurberiana		4.4	60
Sitanion hystrix		4.0	100
Agropyron spicatum		3.8	20
Bromus tectorum			20
Stipa comata			20
Oenothera caespitosa		4.9	60
Lygodesmia spinosa		3.1	80
Eriogonum andinum		2.7	20
Chaenactis douglasii		2.2	60
Cryptantha jamesii		1.8	80
Aster scopulorum		1.7	20
Eriogonum umbellatum var. *aridum*			100
Phlox diffusa			80
Collomia grandiflora			40
Arenaria kingii			20
Astragalus hornii			20
Astragalas purshii			20
Chenopodium leptophyllum			20
Delphinium Andersonii			20
Erigeron pumilus			20
Phlox longifolia			20
Lappula redowskii			20
Opuntia polyacantha			20

*Frame size in inches

Table 37. Non-living Ground Cover for the *Juniperus osteosperma* Community

Material	Cover %
Bare ground	24.3
Litter	21.1
Pavement	31.7
Rock	22.9

2. *Juniperus osteosperma/Artemisia nova* Community

This community occurs in the south central and southern part of the watershed on northeast facing slopes of 11 to 45 percent. Elevation ranges from 5200 to 5500 feet and the mean annual precipitation is 10.2 inches (Appendix A).

Utah juniper *(Juniperus osteosperma)* occurs with 16.4 percent cover. Black sagebrush is the most abundant shrub (6.1 percent cover and 41.8 percent frequency). Yellowbrush *(Chrysothamnus viscidiflorus)* and fourwing saltbrush *(Atriplex canescens)* are found with 11.5 and 3.7 percent frequency (Table 38).

Bottlebrush squirreltail *(Sitanion hystrix)* and Sandberg bluegrass *(Poa secunda)* are the most frequent grasses (25.0 and 23.7 percent). A number of additional grasses occur in small quantities.

Douglas chaenactis *(Chaenactis douglasii)* and *Phlox diffusa* are each found with 7.7 percent frequency. Other forbs occur with lower frequency percentages. This community is a seral representative of a *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* habitat-type.

Litter accounts for 35.8 percent of the non-living ground cover, pavement for 26.3 percent, rock for 21.6 percent, and bare ground for 16.3 percent (Table 39).

The soil at the macroplots where this community was sampled is a member of a loamy-skeletal, mixed, frigid, shallow family of Duric Xerollic Camborthids (Appendix B-7).

Table 38. Species Cover, Frequency, and Constancy for the *Juniperus osteosperma/Artemisia nova* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Juniperus osteosperma	16.4		
Artemisia nova	6.1	41.8	100
Chrysothamnus viscidiflorus		11.5	100
Atriplex canescens		3.7	33
Sitanion hystrix		25.0	100
Poa secunda		23.7	100
Bromus tectorum		11.7	33
Agropyron spicatum		8.0	100
Stipa thurberiana		6.7	33
Oryzopsis hymenoides		5.3	67
Agropyron smithii			33
Poa nevadensis			33
Chaenactis douglasii		7.7	100
Phlox diffusa		7.7	100
Eriastrum diffusum		6.2	33
Eriogonum umbellatum		5.0	100
Gayophytum ramosissimum		3.8	33
Cryptantha jamesii		3.2	67
Chenopodium album		3.0	67
Astragalus lentiginosis		2.7	67
Halogeton glomeratus		2.3	33
Astragalus purshii		1.7	67
Phlox longifolia		1.7	67
Lupinus caudatus		1.3	33
Arenaria kingii		1.0	33
Caulanthus crassicaulis		1.0	33
Oenothera caespitosa		1.0	67
Leptodactylon pungens			67
Opuntia polyacantha			67
Penstemon kingii			67
Allium acuminatum			33
Aster scopulorum			33
Astragalus curvicarpus			33
Astragalus iodantus			33
Calochortus nuttallii			33
Crepis acuminata			33
Euphorbia lathyrys			33
Lappula redowskii			33
Machaeranthara canescens			33
Mentzelia albicaulis			33
Monolepis nuttalliana			33
Sphaeralcea coccinea			33

*Frame size in inches

Table 39. Non-living Ground Cover for the *Juniperus osteosperma/Artemisia nova* Community

Material	Cover %
Bare ground	16.3
Litter	35.8
Pavement	26.3
Rock	21.60

3. *Juniperus osteosperma/Artemisia nova/ Agropyron spicatum* Community

This community has developed in the southern, central and eastern parts of the basin on north, northeast, east and west facing slopes of 4 to 56 percent. Elevation ranges from 5350 to 5500 feet, and the mean annual precipitation is 10.5 inches (Appendix A).

Utah juniper *(Juniperus osteosperma)* is the dominant species with 11.5 percent cover. Black sagebrush *(Artemisia nova)* is the most abundant shrub (7.8 percent cover, and 38.8 percent frequency) with yellowbrush *(Chrysothamnus viscidiflorus)* and rubber rabbitbrush *(Chrysothamnus nauseosus)* less frequent (9.5 and 0.5 percent) (Table 40).

Bluebunch wheatgrass *(Agropyron spicatum)* and Sandberg bluegrass *(Poa secunda)* occur with 3.8 and 0.6 percent cover, and 42.7 and 50.3 percent frequency, respectively. A number of additional grasses are found in small quantities.

Kings sandwort *(Arenaria kingii)* is the most frequent forb (11.0 percent), with a large number of additional forbs occurring with trace to 9.7 percent frequencies. This community is a seral representative of the *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* habitat-type.

Litter accounts for 42.0 percent of the non-living ground cover, rock for 29.1 percent, bare ground for 19.6 percent and pavement for 9.3 percent (Table 41).

The soils at the macroplots where this community was sampled are members of a loamy-skeletal, mixed, frigid, shallow family of Xerollic Camborthids (Appendix B-6); fine, mixed, frigid family of Xerollic Haplargids (Appendix B-18); and fine-skeletal, mixed, frigid family of Xerollic Durargids (Appendix B-20).

Table 40. Species Cover, Frequency, and Constancy for the *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Juniperus osteosperma	11.5		
Artemisia nova	7.8	38.8	100
Chrysothamnus viscidiflorus		9.5	100
Chrysothamnus nauseosus		0.5	33
Agropyron spicatum	3.8	42.7	100
Poa secunda	0.6	50.3	100
Sitanion hystrix	0.3	12.5	67
Stipa comata	0.2	6.5	33
Bromus tectorum		6.5	33
Oryzopsis hymenoides		3.5	33
Stipa thurberiana		2.8	67
Poa nevadensis		1.3	33
Arenaria kingii		11.0	100
Eriogonum Heermannii		9.2	33
Phlox diffusa		8.7	100
Aster scopulorum		7.0	67
Erigeron linearis		5.2	33
Crepis acuminata		4.8	100
Erigeron pumilus		4.5	67
Phlox longifolia		4.5	100
Penstemon kingii		4.2	67
Leptodactylon pungens		3.7	67
Astragalus lentiginosus		3.2	33
Eriogonum umbellatum		2.7	67
Astragalus purshii		2.2	67
Lappula redowskii		1.7	33
Eriastrum diffusum		1.5	67
Castilleja linariaefolia		1.3	33
Arabis Holboellii			67
Calochortus nuttallii			67
Lomatium sp.			67
Mentzelia albicaulis			67
Opuntia polyacantha			67
Astragalus atratus			33
Astragalus hornii			33
Castilleja brewerii			33
Chaenactis douglasii			33
Chenopodium album			33
Chenopodium leptophyllum			33
Machaeranthara canescens			33

*Frame size in inches

Table 41. Non-living Ground Cover for the *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* Community

Material	Cover %
Bare ground	19.6
Litter	42.0
Pavement	9.3
Rock	29.1

4. *Juniperus osteosperma/Artemisia tridentata/ Agropyron spicatum* Community

This community has developed in the eastern part of the watershed on east and north facing slopes of 12 to 18 percent. Elevation ranges from 5250 to 5500 feet, and the mean annual precipitation is 10.9 inches (Appendix A).

Utah juniper *(Juniperus osteosperma)* occurs with 8.6 percent cover. Big sagebrush *(Artemisia tridentata)* is the most abundant shrub (6.0 percent cover and 17.5 percent frequency). Yellowbrush *(Chrysothamnus viscidiflorus)* and prickly phlox *(Leptodactylon pungens)* are found with low frequency percentages (7.5 and 3.0) (Table 42).

Bluebunch wheatgrass *(Agropyron spicatum)*, Thurber needlegrass *(Stipa thurberiana)*, Sandberg bluegrass *(Poa secunda)*, and bottlebrush squirreltail *(Sitanion hystrix)* occur with frequency percentages of 26.2, 13.8, 40.0 and 13.0, respectively

The most frequent forbs are sulfur eriogonum *(Eriogonum umbellatum)* and Crag aster *(Aster scopulorum)* with 16.2 and 11.2 percent frequency. A number of additional forbs occur with small frequency values. This community is a representative of the *Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* habitat-type.

Litter accounts for 37.8 percent of the non-living ground cover, pavement for 27.0 percent, bare ground for 20.5 percent and rock for 14.7 percent (Table 43).

The soil at the macroplots where this community was sampled is a member of a coarse-loamy, mixed, frigid family of Xerollic Haplargids (Appendix B-14).

Table 42. Species Cover and Frequency for the *Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* Community

Species	Cover %	20 x 20* Frequency %
Juniperus osteosperma	8.6	
Artemisia tridentata	6.0	17.5
Chrysothamnus viscidiflorus		7.5
Leptodactylon pungens		3.0
Agropyron spicatum	1.3	26.2
Stipa thurberiana	0.6	13.8
Poa secunda		40.0
Sitanion hystrix		13.0
Stipa comata		5.8
Oryzopsis hymenoides		3.2
Agropyron smithii		1.2
Poa nevadensis		1.0
Eriogonum umbellatum		16.2
Aster scopulorum		11.2
Astragalus iodantus		9.2
Cryptantha jamesii		7.8
Antennaria dimorpha		6.5
Eriastrum diffusum		6.5
Phlox longifolia		6.2
Chaenactis douglasii		4.8
Crepis acuminata		4.5
Phlox diffusa		4.5
Astragalus lentiginosis		4.2
Aster scopulorum		4.0
Eriogonum Heermanni		4.0
Astragalus purshii		3.6
Lappula redowskii		3.0
Delphinium Andersonii		2.8
Erigeron pumilus		1.5
Opuntia polyacantha		1.2
Allium acuminatum		1.0
Arenaria kingii		1.0
Astragalus atratus		
Astragalus hornii		
Calochartus nuttallii		
Castilleja linariaefolia		
Mentzelia albicaulis		

*Frame size in inches

Table 43. Non-living Ground Cover for the *Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* Community

Material	Cover %
Bare ground	20.5
Litter	37.8
Pavement	27.0
Rock	14.7

5. *Juniperus osteosperma/Artemisia tridentata/ Stipa comata* Community

This small community has developed in the north central part of the basin on hills of all aspects with 3 to 14 percent slope. Elevation ranges from 5400 to 5800 feet, and the mean annual precipitation is 10.6 inches (Appendix A).

Utah juniper *(Juniperus osteosperma)* occurs with 6.1 percent cover. Big sagebrush *(Artemisia tridnetata)* and yellowbrush *(Chrysothamnus viscidiflorus)* are the most abundant shrubs (3.4 and 2.0 percent cover, and 8.3 and 9.5 percent frequency, respectively). Antelope bitterbrush *(Purshia tridentata)* and rubber rabbitbrush *(Chrysothamnus nauseosus)* are found in small quantities (Table 44).

Needle-and-threadgrass *(Stipa comata)*, the most abundant grass, occurs with 7.2 percent cover and 70.2 percent frequency. A number of additional grasses are found with frequency percentages that range from a trace to 14.4 percent. *Carex* sp. is found with 1.1 percent frequency.

There are a large number of forbs found in the community, of these groundsmoke *(Gayophytum ramosissimum)* is the most frequent (15.6 percent). This community is a representative of the *Juniperus osteosperma/Artemisia tridentata/Stipa comata* habitat-type.

Litter accounts for 65.5 percent of the non-living ground cover, bare ground for 29.4 percent, pavement for 2.6, and rock for 2.5 percent (Table 45).

The soil at the macroplots where this community was sampled is a member of a sandy, mixed, frigid family of Typic Torripsamments (Appendix B-1).

Table 44. Species Cover, Frequency, and Constancy for the *Juniperus osteosperma/Artemisia tridentata/Stipa comata* Community

Species	Cover %	20 x 20* Frequency %	Constancy %
Juniperus osteosperma	6.1		
Artemisia tridentata	3.4	8.3	100
Chrysothamnus viscidiflorus	2.0	9.5	100
Purshia tridentata		1.3	60
Chrysothamnus nauseosus			20
Stipa comata	7.2	70.2	100
Oryzopsis hymenoides	0.6	10.1	100
Agropyron smithii		14.4	100
Bromus tectorum		7.3	40
Poa secunda		4.8	60
Sitanion hystrix		4.5	80
Poa nevadensis		1.1	40
Agropyron cristatum			20
Carex sp.		1.1	40
Gayophytum ramosissimum		15.6	80
Eriastrum diffusum		8.0	60
Leptodactylon pungens		6.1	100
Lappula redowskii		4.6	80
Eriogonum umbellatum		2.4	80
Descurainia sophia		1.8	60
Mentzelia albicaulis		1.7	60
Phlox longifolia		1.6	40
Lygodesmia spinosa		1.0	40
Arenaria kingii			60
Chaenactis douglasii			40
Crepis acuminata			40
Opuntia polyacantha			40
Arabis Holboellii			20
Chenopodium leptophyllum			20
Fritillaria atropurpurea			20
Machaeranthara canescens			20

*Frame size in inches

Table 45. Non-living Ground Cover for the *Juniperus osteosperma/Artemisia tridentata/Stipa comata* Community

Material	Cover %
Bare ground	29.4
Litter	65.5
Pavement	2.6
Rock	2.5

Quaking Aspen *(Populus tremuloides)* Communities

1. *Populus tremuloides/Prunus virginiana* Community

This community has developed as small inclusions in the western part of the basin on northeast facing slopes of 28 percent. Elevation is around 7000 feet, and the mean annual precipitation is 15.2 inches (Appendix A).

Quaking aspen *(Populus tremuloides)* and chokecherry *(Prunus virginiana)* are the dominant species (dominance rating-4). Snowbrush *(Ceanothus velutinus)*, longflower snowberry *(Symphoricarpos longiflorus)*, big sagebrush *(Artemisia tridentata)* and Woods rose *(Rosa woodsii)* occur in small amounts (Table 46).

The most abundant grasses are slender wheatgrass *(Agropyron trachycaulum)* and Canby bluegrass *(Poa canbyi)*.

A number of forbs are found throughout the community in small amounts. This community is a *Populus tremuloides/Prunus virginiana/Agropyron trachycaulum* habitat-type.

The soil associated with this family is a member of a loamy-skeletal, mixed, frigid family of Typic Argixerolls (Appendix B-29).

Table 46. Species Dominance Rating for the *Populus tremuloides/ Prunus virginiana* Community

Species	Dominance
Populus tremuloides	4
Prunus virginiana	4
Ceanothus velutinus	3
Symphoricarpos longiflorus	2
Artemisia tridentata	1
Rosa woodsii	1
Agropyron trachycaulum	2
Agropyron spicatum	1
Poa canbyi	1
Agastache urticifolia	1
Arenaria hookeri	1
Balsamorhiza sagittata	1
Cirsium vulgare	1
Collinsia grandiflora	1
Comandra pallida	1
Gayophytum ramosissimum	1
Lomatium sp.	1
Lupinus caudatus	1
Mentzelia dispersa	1

2. *Populus tremuloides/Poa nevadensis/ Taraxacum officinale* Community

This small community has developed in the western part of the watershed as inclusions in south facing drainage bottoms with 2 percent slope. The elevation is around 6400 feet and the mean annual precipitation is 15.2 inches (Appendix A).

Quaking aspen *(Populua tremuloides)* is the dominant species with 21.5 percent cover. Willow *(Salix* sp.*)* and big sagebrush *(Artemisia tridentata)* occur with 4.5 and 2.0 percent cover, respectively (Table 47).

Nevada bluegrass *(Poa nevadensis)* is the most abundant grass with 20.5 percent cover and 45.0 percent frequency. Cheatgrass *(Bromus tectorum)* and redtop *(Agrostis alba)* occur in small quantities. *Carex* sp. is found with 2.0 percent cover and 18.5 percent frequency.

Common dandelion *(Taraxacum officinale)* and silver cinquefoil *(Potentilla argentea)* are the most abundant forbs (24.5 and 8.5 percent cover, and 42.5 and 29.0 percent frequency, respectively). A few additional shrubs occur in small amounts. This community is a *Populus tremuloides/Poa nevadensis* habitat-type.

Litter accounts for 23.0 percent of the ground cover, bare ground for 12.0 percent, pavement for 1.0, and rock for 0.5 percent (Table 47).

The soil at the macroplots where this community was sampled is a member of a fine-loamy, mixed, frigid family of Cumulic Haplaquolls (Appendix B-23).

Table 47. Species Cover and Frequency for the *Populus tremuloides/ Poa nevadensis/Taraxacum officinale* Community

Species	Cover %**	12 x 12* Frequency %
Populus tremuloides	21.5	
Salix sp.	4.5	
Artemisia tridentata	2.0	3.0
Poa nevadensis (3 x 3)*	20.5	45.0
Bromus tectorum	1.0	15.5
Agrostis alba		8.0
Carex sp.	2.0	18.5
Taraxacum officinale	24.5	42.5
Potentilla argentea	8.5	29.0
Achillea lanulosa	2.0	11.5
Mimulus glaucescens	1.5	6.5
Descurainia sophia	1.0	2.0
Iris missouriensis	1.0	0.5
Monolepis nuttalliana	0.5	5.5
Nasturtium officinale		2.0
Rumex sp.		0.5
Urtica sp.		0.5
Litter	23.0	
Bareground	12.0	
Pavement	1.0	
Rock	0.5	

*Frame size in inches
**Point frame

Longflower Snowbrush *(Symphoricarpos longiflorus)* Communities

1. *Symphoricarpos longiflorus/Artemisia tridentata/ Amelanchier pallida/Festuca idahoensis* Community

This community has developed in the western part of the watershed on north and east facing convex slopes of 7 to 25 percent. Elevation ranges from 6300 to 6800 feet, and the mean annual precipitation is 13.9 inches (Appendix A).

Longflower snowbrush *(Symphoricarpos longiflorus)*, big sagebrush *(Artemisia tridentata)* and serviceberry *(Amelanchier pallida)* are the most abundant shrubs in the community (10.0, 9.3 and 7.1 percent cover, and 21.8, 16.5 and 7.2 percent frequency, respectively). Antelope bitterbrush *(Purshia tridentata)* and yellowbrush *(Chrysothamnus viscidiflorus)* occur with 3.3 and 3.2 percent cover, and 4.2 and 13.4 percent frequency, respectively (Table 48).

Idaho fescue *(Festuca idahoensis)* and bluebunch wheatgrass *(Agropyron spicatum)* occur with 0.5 and 0.3 percent cover, and 28.9 and 13.0 percent frequency. Subalpine needlegrass *(Stipa columbiana)*, western wheatgrass *(Agropyron smithii)* and Sandberg bluegrass *(Poa secunda)* are found with frequency percents of 19.9, 19.2 and 17.5, respectively. A number of additional grasses have small frequency values. *Carex* sp. is found with 2.4 percent frequency.

Tailcup lupine *(Lupinus caudatus)* and little flower collinsia *(Collinsia parviflora)* are most frequent forbs (23.8 and 14.9 percent, respectively). A large number of additional forbs occur with frequency values that range from a trace to 12.0 percent. This community is probably an *Amelanchier pallida/Artemisia tridentata/ Symphoricarpos longiflorus/Festuca idahoensis* habitat-type.

Litter accounts for 90.2 percent of the non-living ground cover, bare ground for 6.7 percent, pavement for 2.1 percent, and rock for 1.0 percent (Table 49).

The soil at the macroplots where this community was sampled is a member of a fine, mixed, frigid family of Pachic Argixerolls (Appendix B-35).

Table 48. Species Cover, Frequency, and Constancy for the *Symphoricarpos longiflorus/Artemisia tridentata/Amelanchier pallida/Festuca idahoensis* Community.

Species	Cover %	20 x 20* Frequency	Constancy %
Symphoricarpos longiflorus	10.0	21.8	100
Artemisia tridentata	9.3	16.5	100
Amelanchier pallida	7.1	7.2	100
Purshia tridentata	3.3	4.2	50
Chrysothamnus viscidiflorus	3.2	13.4	100
Festuca idahoensis	0.5	28.9	100
Agropyron spicatum	0.3	13.0	75
Stipa columbiana		19.9	75
Agropyron smithii		19.2	100
Poa secunda		17.5	75
Bromus tectorum		9.0	50
Poa nevadensis		6.1	75
Sitanion hystrix		1.6	50
Elymus cinereus		1.2	25
Agropyron trachycaulum		1.2	25
Melica bulbosa			25
Carex sp.		2.4	25
Lupinus caudatus		23.8	75
Collinsia parviflora		14.9	100
Balsamorhiza sagittata		12.0	100
Comandra umbellata		10.0	100
Castilleja linariaefolia		7.4	25
Senecio integerrimus		5.9	75
Phlox longifolia		3.8	50
Agastache urticifolia		3.2	50
Descurainia sophia		3.2	25
Chenopodium leptophyllum		2.2	25
Eriogonum Heermannii		2.1	50
Lappula redowskii		1.8	25
Eriogonum umbellatum		1.6	25
Penstemon kingii		1.5	25
Achillea millefolium			50
Arabis Holboellii			50
Delphinium Andersonii			50
Aster adscendens			25
Castilleja Brewerii			25
Cirsium vulgare			25
Crepis acuminata			25
Geranium Richardsoni			25
Mentzelia dispersa			25

*Frame size in inches

Table 49. Non-living Ground Cover for the *Symphoricarpos longiflorus/Artemisia tridentata/Amelanchier pallida/Festuca idahoensis* Community

Material	Cover %
Bare ground	6.7
Litter	90.2
Pavement	2.1
Rock	1.0

2. *Symphoricarpos longiflorus/Elymus cinereus* Community

This community is found in the southeastern and western parts of the basin on north facing slopes of 25 to 60 percent. Elevation ranges from 6200 to 6400 feet. The mean annual precipitation is 13.3 inches (Appendix A).

Longflower snowberry *(Symphoricarpos longiflorus)* is the dominant species (23.9 percent cover and 48.0 percent frequency). A number of additional shrubs occur in the community with frequency values of trace to 13.1 percent (Table 50).

The most abundant grass in the community is Great Basin wildrye *(Elymus cinereus)* (9.6 percent cover and 42.7 percent frequency). Respectively, slender wheatgrass *(Agropyron trachycaulum)* and Idaho fescue *(Festuca idahoensis)* occur with 0.6 and 0.5 percent cover, and 15.8 and 28.0 percent frequency. A few other grasses are found with low frequency values. Baltic rush *(Juncus balticus)* occurs with 1.3 percent frequency.

Nettleleaf gianthyssop *(Agastache urticifolia)* and tailcup lupine *(Lupinus caudatus)* are the most frequent forbs (14.0 and 22.2 percent, respectively). Additional forbs occur in small quantities. This community is a *Symphoricarpos longiflorus/Elymus cinereus* habitat-type.

Non-living ground cover data were not taken for this community.

The soil at the macroplots where this community was sampled is a member of a fine-loamy, mixed, frigid family of Pachic Argixerolls (Appendix B-34).

Table 50. Species Cover, Frequency, and Constancy for the *Symphoricarpus longiflorus/Elymus cinereus* Community

Species	Cover %	10 x 10* Frequency %	Constancy %
Symphoricarpus longiflorus	23.9	48.0	100
Prunus virginiana		13.1	100
Chrysothamnus viscidiflorus		7.7	100
Rosa woodsii		6.3	33
Potentilla gracilis		4.7	100
Amelanchier alnifolia		3.5	67
Ribes aureum		2.8	33
Amelanchier pallida			33
Elymus cinereus	9.6	42.7	100
Agropyron trachcaulum	0.6	15.8	67
Festuca idahoensis	0.5	28.0	100
Stipa columbiana		8.7	67
Agropyron smithii		7.3	67
Bromus tectorum		1.2	33
Poa longiligula		1.2	67
Melica bulbosa			33
Juncus balticus		1.3	67
Agastache urticifolia	0.4	14.0	67
Lupinus caudatus		22.2	100
Aster adscendens		10.2	100
Geranium richardsonii		9.2	100
Mentzelia dispersa		6.6	67
Machaeranthara canescens		3.3	33
Crepis acuminata		1.0	67
Achillea lanulosa			33
Erigeron asperugineus			33

*Frame size in inches

DISCUSSION

Management Areas

Livestock grazing in most communities has been associated with a reduction of the more palatable grass species and the invasion or increase of undesirable plants. The result has been an apparent decrease in cover and frequency of some of the more desirable forage species.

In order to improve the condition of the Rock Springs Watershed as well as livestock and wildlife production, the Bureau of Land Management has: 1) regulated cattle numbers and the grazing season; 2) developed water resources and built fences for better livestock distribution; 3) seeded wheatgrass and chemically controlled big sagebrush.

Range Rehabilitation and Improvement: There are a number of communities that have been seeded to wheatgrass. These are: western part of the watershed - *Artemisia tridentata/Agropyron smithii Poa nevadensis, Artemisia tridentata/Chrysothamnus nauseosus, Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda, Artemisia tridentata/Sitanion hystrix, Artemisia tridentata/Stipa comata/Agropyron smithii, Artemisia tridentata/Stipa thurberiana;* southern part of the watershed - *Artemisia tridentata/Stipa comata/Agropyron smithii, Artemisia tridentata/Agropyron smithii.*

In the western part of the watershed adjacent to the seeding, 3000 acres of the *Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda* and *Artemisia tridentata/Sitanion hystrix* communities have been sprayed with 2-4D. This treatment controlled *Artemisia tridentata* and released grasses like *Stipa thurberiana, Agropyron spicatum, Agropyron smithii.*

The above mentioned communities will lend themselves to further mechanical or chemical improvement elsewhere in the watershed.

The *Artemisia arbuscula/Poa secunda* and *Artemisia nova/Poa secunda* communities are seral representatives of *Artemisia arbuscula/Agropyron spicatum* and *Artemisia nova/Agropyron spicatum* habitat-types, respectively. These communities have a fairly high frequency of palatable grasses such as *Agropyron smithii, Agropyron spicatum, Stipa thurberiana, Festuca idahoensis.* They occur on slopes of 4 to 29 percent, rock cover is 10.5 to 16.0 percent, and annual precipitation is 13.9 inches. These communities could be sprayed to control undesirable shrubs.

Management by Grazing: The vegetation-soil units in this watershed have a high potential and should respond well to a grazing management system such as rest-rotation or deferred rotation.

Ecological Interpretations

The *Amelanchier pallida/Artemisia tridentata/Agropyron spicatum, Artemisia nova/Agropyron spicatum, Artemisia tridentata/Stipa comata. Artemisia tridentata/Stipa thurberiana, Juniperus osteosperma, Juniperus osteosperma/ Artemisia nova/Agropyron spicatum, Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum, Juniperus osteosperma/Artemisia tridentata/Stipa comata,* and *Symphoricarpos longiflorus/Elymus cinereus* communities are in near pristine condition, while all other communities are seral. These communities and their associated soils are given in Appendix C and discussed below.

In the southeast and west part of the watershed on north and east facing convex slopes of 21 to 29 percent, the *Amelanchier pallida/Artemisia tridentata/Agropyron spicatum* community is found. It represents the *Amelanchier pallida/Artemisia tridentata/Agropyron spicatum* habitat-type. The community occurs on soils which have a 14-inch mollic epipedon over a moderate medium subangular blocky, very gravelly sandy clay loam argillic horizon.

The *Symphoricarpos longiflorus/Artemisia tridentata/Amelanchier pallida/Festuca idahoensis* community is probably a seral representative of an *Amelanchier pallida/Artemisia tridentata/Symphoricarpos longiflorus/Festuca idahoensis* habitat-type. This community occurs in the western part of the watershed on north and east facing convex slopes of 7 to 25 percent. It occurs on soils with a 31-inch mollic epipedon over and in conjunction with a strong medium subangular blocky, gravelly clay argillic horizon and paralithic contact within 31 inches of the soil surface.

In the western part of the watershed on west and south facing mountain slopes of 9 to 29 percent the *Artemisia arbuscula/Poa secunda* community is found. It occurs on soils with a 4-inch ochric epipedon over a strong medium angular block, gravelly clay argillic horizon, weathered sandstone within 21 inches of the soil surface; or a 12-inch mollic epipedon over and in conjunction with a moderate fine subangular blocky, gravelly clay argillic horizon. This community is probably a seral representative of an *Artemisia arbuscula/Agropyron spicatum* habitat-type.

The *Artemisia nova/Agropyron spicatum, Artemisia nova/Poa secunda,* and *Artemisia nova/Sitanion hystrix* communities occur on all aspects with 3 to 33 percent slope in the southern and western part of the watershed. These communities are probably representatives of an

Artemisia nova/Agropyron habitat-type. The soils are characterized by a 5- to 7- inch ochric epipedon over a massive or moderate medium subangular blocky cambic horizon and may have a weakly cemented duripan within 13 inches of the soil surface; or a 2- to 14-inch ochric epipedon over an argillic horizon and may have paralithic contact within 7 inches of the soil surface.

The *Artemisia tridentata/Agropyron smithii/Poa nevadensis* and *Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda* communities are probably seral representatives of an *Artemisia tridentata/Agropyron spicatum* habitat-type. These communities occur in most parts of the watershed on most aspects of 1 to 25 percent slope. The soils are characterized by a 5- to 6-inch ochric epipedon over a strong medium angular blocky to a moderate medium subangular blocky argillic horizon and may have an indurated duripan within 14 inches of the soil surface, or a 6-inch mollic epipedon over a moderate medium subangular blocky clay argillic horizon and paralithic contact within 19 inches of the soil surface.

In the southern part of the watershed on south and east facing drainage bottoms of 1 percent slope the *Artemisia tridentata/Chrysothamnus nauseosus* and *Chrysothamnus nauseosus* communities have developed. They are probably seral representatives of an *Artemisia tridentata/Elymus cinereus* habitat-type. The soils have a 9-inch ochric epipedon over a massive, silty clay loam cambic horizon; or a 13-inch mollic epipedon over a massive, silty clay loam cambic horizon.

The *Artemisia tridentata/Stipa comata, Artemisia tridentata/Agropyron cristatum, Artemisia tridentata/Stipa comata/Agropyron smithii,* and *Chrysothamnus viscidiflorus/Stipa comata* communities are probably representatives of an *Artemisia tridentata/Stipa comata* habitat-type. These communities are found on all aspects of 1- to 15 percent slope in most parts of the watershed. The soils have a 7-inch ochric epipedon over a massive gravelly loamy sand C1 horizon

The *Artemisia tridentata/Stipa thurberiana, Artemisia tridentata/Agropyron cristatum* and *Artemisia tridentata/Sitanion hystrix* communities are probably representatives of an *Artemisia tridentata/Stipa thurberiana* habitat type. These communities occur in the western part of the watershed on most aspects with 2 to 6 percent slopes. The soil typically has a 5- to 6-inch ochric epipedon over a massive or moderate medium subangular blocky cambic horizon and may have a weakly cemented duripan within 13 inches of soil surface, a 2-inch ochric epipedon over a moderate medium angular blocky clay argillic horizon, or a 6-inch ochric epipedon over a weak medium subangular blocky clay loam horizon and a weakly cemented duripan within 26 inches of the soil surface.

The *Juniperus osteosperma* community has developed in the east central part of the watershed on south facing slopes of 29 to 50 percent. The soils have a 4-inch ochric epipedon over a very gravelly loamy sand C1 horizon and paralithic contact within 12 inches of the surface, or a -inch ochric epipedon over a weak medium subangular blocky, gravelly clay loam argillic horizon and paralithic contact within 13 inches of the soil surface. This community is a representative of a *Juniperus osteosperma* habitat-type.

The *Juniperus osteosperma/Artemia nova/Agropyron spicatum* and *Juniperus osteosperma/Artemisia nova* communities occur in the south central part of the watershed on north and northeast facing slopes of 4 to 56 percent. They are probably representative of a *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* habitat-type. The soil typically has a 3- to 7-inch ochric epipedon over a massive cambic horizon, may have a weakly cemented duripan; a 4-inch ochric epipedon over a moderate medium prismatic gravelly clay argillic horizon and usually sandstone within 29 inches of the soil surface; or a 3-inch ochric epipedon over a moderate medium subangular blocky gravelly clay loam argillic horizon and an indurated duripan within 10 inches of the soil surface.

In the eastern part of the watershed on east and north facing slopes of 2 to 18 percent the *Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* community has developed. It occurs on soils with a 10-inch ochric epipedon over a moderate medium subangular blocky sandy clay argillic horizon. This community is a representative of a *Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* habitat-type.

The *Juniperus osteosperma/Artemisia tridentata/Stipa comata* community is a representataive of the *Juniperus osteosperma/Artemisia tridentata/Stipa comata* habitat-type. It occurs in the central part of the watershed on hills of all aspects with 3 to 14 percent slope. The soils have a 7-inch ochric epipedon over a massive gravelly loamy sand C1 horizon.

The *Poa nevadensis/Carex* sp. habitat-type is represented by the following communities: *Artemisia tridentata/Agropyron cristatum, Artemisia tridentata/Agropyron smithii,* and *Juncus balticus/Poa nevadensis.* These communities occur in the southern and western parts of the watershed on south, southeast and northern drainage bottoms of 1 to 5 percent. The soils are characterized by a 20-inch mollic epipedon over a massive clay loam 11C1 horizon; a 10-inch mollic epipedon over a massive gravelly sandy clay loam 11C1 horizon; a 24-inch mollic epipedon over and in conjunction with a moderate medium subangular blocky clay argillic horizon; or a 14-inch mollic

epipedon over a moderate medium subangular blocky clay loam argillic horizon and paralithic contact within 29 inches of the soil surface.

The *Populus tremuloides/Poa nevadensis/Taraxacum officinale* community is found in the western part of the watershed as inclusions in southwest facing drainage bottoms. This community is probably a seral representative of a *Populus tremuloides/Poa nevadensis* habitat-type. The soils have a 30-inch mollic epipedon with mottles at 30 inches of the soil surface.

The *Populus tremuloides/Prunus virginiana* community is a seral representative of a *Populus tremuloides/Prunus virginiana/Agropyron trachycaulum* habitat-type. It has developed as small inclusions in the western part of the watershed on northeast facing slopes of 28 percent. The soils have a 15-inch mollic epipedon over, and in conjunction with, a moderate medium subangular blocky, very gravelly clay loam argillic horizon.

The *Symphoricarpos longiflorus/Elymus cinereus* community is a representative of the *Symphoricarpos longiflorus/Elymus cinereus* habitat-type. It is found in the southeastern and western parts of the watershed on north facing slopes of 25 to 60 percent. The soils have a 40-inch mollic epipedon over and in conjunction with a medium moderate subangular blocky, gravelly silty clay loam argillic horizon.

Climaxes:

Climax as used in this report is defined as the kind of community capable of perpetuation under the prevailing climatic, edaphic, physiographic or biotic condition. This definition is in accordance with the polyclimax concept where several climaxes constitute the vegetation in an areas as the result of succession.

Climatic climax develops on land (moderately rolling to level) that is neither excessively or inadequately drained, so that the major environmental conditions affecting organisms are climatic. Physiographic climax is determined in large measure by the nature of the topography (land relief). Edaphic climax is determined largely by the nature of the soil. A physiographic-edaphic climax is determined mostly by both topography and soils. A biotic climax is determined by the incidence and maintenance of a decisive "biotic factor" such as the continuous heavy grazing by animals (Hanson, 1962).

Most all of the communities in the watershed have been affected by grazing and areas of relatively undisturbed vegetation are not common. Consequently, a majority of the communities are biotic climaxes. For this reason an estimate of the climax of each com-

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APPENDIX A. Precipitation Data for Rock Springs Watershed.

Rain can	Annual Precipitation (Inches)	Rain can	Annual* Precipitation (Inches)
1	10.3	11	8.8
2	10.0	12	11.4
3	8.5	13	12.2
4	12.1	14	14.7
5	15.2	15	13.1
6	10.8	16	11.2
7	10.0	17	10.1
8	13.0	18	11.2
9	15.7	19	10.8
10	13.9	20	10.2
		Mean	11.5

* Annual precipitation is based on 6 consecutive hydrologic years (October 1 to September 30), 1964 through 1969.

Community	Annual* Precipitation (Inches)
Amelanchier pallida/Artemisia tridentata/Agropyron spicatum	12.8
Artemisia arbuscula/Poa secunda	13.9
Artemisia nova/Agropyron spicatum	11.5
A. nova/Poa secunda	13.9
A. nova/Sitanion hystrix	10.0
Artemisia tridentata/Agropyron cristatum	10.3
A. tridentata/Agropyron smithii	9.8
A. tridentata/A. smithii/Poa nevadensis	10.1
A. tridentata/Chrysothamnus nauseosus	10.3
A. tridentata/Chrysothamnus viscidiflorus/Poa secunda	10.1
A. tridentata/Sitanion hystrix	10.5
A. tridentata/Stipa comata	10.7
A. tridentata/S. comata/Agropyron smithii	10.9
A. tridentata/Stipa thurberiana	9.9
A. tridentata/Symphoricarpos longiflorus/Agropyron spicatum	13.9
Chrysothamnus nauseosus	10.3
Chrysothamnus viscidiflorus/Stipa comata	10.7
Juncus balticus/Poa nevadensis	14.0
Juniperus osteosperma	10.1
J. osteosperma/Artemisia nova	10.2
J. osteosperma/A. nova/Agropyron spicatum	10.5
J. osteosperma/Artemisia tridentata/Agropyron spicatum	10.9
J. osteosperma/A. tridentata/Stipa comata	10.6
Populus tremuloides/Prunus virginiana	15.2
P. tremuloides/Poa nevadensis/Taraxacum officinale	15.2
Symphoricarpos longiflorus/Amelanchier pallida/Festuca idahoensis	13.9
S. longiflorus/Elymus cinereus	13.3

* Annual precipitation is based on rain can in or near each community and on 6 consecutive hydrologic years (October 1 to September 30), 1964 through 1969.

APPENDIX B - Soil Familes and Sub-groups Associated with the Rock Springs Watershed Plant Communities.

APPENDIX B-1

Sandy, mixed, frigid family of Typic Torripsamments

Characteristically these soils have a 7-inch ochric epipedon over a massive, gravelly loamy sand C1 horizon. Reaction of the surface horizon is neutral.

These soils are usually found at elevations from 5300 to 5800 feet and are associated with the *Artemisia tridentata/Stipa comata/Agropyron smithii, Juniperus osteosperma/Artemisia tridentata/Stipa comata, Artemisia tridentata/Stipa comata, Chrysothamnus viscidiflorus/Stipa comata* communities. They are found on all aspects with 1 to 30% slope. The macrorelief is hilly or undulating and the microrelief is uniform convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 1.8 to 3.6 inches. Stoniness class is 0. The majority of roots are found within 28 inches of the soil surface. There is none to slight sheet and wind erosion.

A1	0-7"	Pale brown (10YR6/3) gravelly loamy sand, brown (10YR4/3) moist; weak fine platy; soft very friable, nonsticky, nonplastic; plentiful fine, very fine, and coarse roots; organic matter 2.2%, conductivity 0.3 mmho., cation exchange capacity 14.8 meq.; non-effervescent; neutral (pH 7.0) abrupt smooth boundary.
C1	7-30"	Pale brown (10YR6/3) gravelly loamy sand, dark yellowish brown (10YR4/4) moist; massive; hard, friable, nonsticky, nonplastic; plentiful fine and few very fine and medium roots; noneffervescent; gradual smooth boundary.
C2	30-40"+	Pale brown (10YR6/3) gravelly loamy sand, yellowish brown (10YR5/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine, fine and medium roots; neutral (pH 7.1).

APPENDIX B-2

Sandy, mixed, frigid shallow family of Typic Xerorthents

These soils typically have a 4-inch ochric epipedon over a very gravelly loamy sand C1 horizon, and have paralithic contact within 12 inches of the surface. Reaction of the surface horizon is strongly alkaline.

These soils are usually found at elevations around 5400 feet and are associated with the *Juniperus osteosperma* community. They are found on south facing slopes of 49%. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 0.8 inch. Stoniness class is 3. The majority of roots are found within 12 inches of the soil surface. There is moderate to advanced gully, sheet and rill erosion.

A1	0-4"	Light brownish gray (10YR6/2) very gravelly loamy sand, brown (10YR4/3) moist; single grain; soft, very friable, nonsticky, nonplastic; moderate very fine and moderate fine roots; organic matter 2.0%, conductivity 0.6 mmho., cation exchange capacity 22.6 meq; violently effervescent; strongly alkaline (pH 8.7); clear smooth boundary.
C1	4-12"	Very pale brown (10YR7-3) very gravelly loamy sand, yellowish brown (10YR5/4) moist; single grain; soft, friable, nonsticky, nonplastic; abundant very fine, fine, medium and plentiful coarse roots; violently effervescent; strongly alkaline (pH 9.0); abrupt irregular boundary.
R1	12"+	Paralithic contact.

APPENDIX B-3

Coarse-loamy, mixed, frigid family of Xerollic Camborthids

Typically these soils have a 6-inch ochric epiepedon over a massive, sandy loam cambic horizon and sandstone within 35 inches of the soil surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 5900 feet and are associated with the *Artemisia tridentata/Stipa thurberiana* community. They are found on southeast facing fans with 5% slope. Macrorelief is undulating and the microrelief is uniform flat. These soils belong to the B hydrologic group and have a profile available water holding capacity of 2.8 inches. Stoniness class is 0. The majority of roots are found within 20 inches of the soil surface. There is slight to no erosion.

A11	0-2"	Grayish brown (10YR5/2) sandy loam, very dark grayish brown (10YR3/2) moist; weak fine platy; slightly hard, friable, nonsticky, nonplastic; few very fine roots; 1.3% organic matter, conductivity 0.15 mmho., cation exchange capacity 20.2 meq., noneffervescent; neutral (pH 6.8); circular pores; abrupt smooth boundary.
A12	2-6"	Dark yellowish brown (10YR3/4) moist; heavy sandy loam; weak medium subangular blocky; slightly hard, friable, slightly sticky, nonplastic; abundant very fine, abundant fine, and plentiful medium roots; noneffervescent; neutral (pH 7.0); clear smooth boundary.
B2	6-22"	Pale brown (10YR6/3) heavy sandy loam, brown (10YR4/3) moist; massive; hard, firm, slightly sticky, nonplastic; plentiful very fine and few fine roots; organic matter 2.4%, conductivity 0.5 mmho.; non effervescent; mildly alkaline (pH 7.5); gradual smooth boundary.
C1	22-35"	Light brownish gray (2.5Y6/2) sand, olive brown (2.5Y4/4) moist; single grain; soft, very friable, nonsticky, nonplastic; plentiful very fine and few fine roots; noneffervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.
R1	35+	Very pale brown (10YR7/4) sand, yellowish brown (10YR5/4) moist; massive extremely hard, extremely firm, nonsticky, nonplastic; noneffervescent to slightly effervescent in some cracks; weathered sandstone.

APPENDIX B-4

Coarse-loamy, mixed, frigid family of Xerollic Camborthids

Characteristically these soils have a 7-inch ochric epipedon over a massive, very gravelly very fine sandy loam cambic horizon. Reaction of the solum increases with depth and ranges from mildly to moderately alkaline.

These soils are usually found at elevations around 6400 feet and are associated with the *Artemisia nova/Agropyron spicatum* community. They are found on north facing slopes of 15 to 20%. Macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 2.9 inches. The majority of roots are found within 16 inches of the soil surface. There is slight to no erosion.

A1	0-7"	Light brownish gray (10YR6/2) very gravelly very fine sandy loam, brown (10YR4/3) moist; weak medium granular; slightly hard, friable, nonsticky, nonplastic; abundant very fine, abudant fine, plentiful medium and few coarse roots; organic matter 3.6%, conductivity 0.2 mmho., cation exchange capacity 25.0 meq.; strongly effervescent; mildly alkaline (pH 7.7); abrupt smooth boundary.
B2	7-13	Pale brown (10YR6/3) very gravelly very fine sandy loam, yellowish brown (10YR5/4) moist; massive; soft, friable, nonsticky, nonplastic; abundant very fine, abundant fine and few medium roots; violently effervescent; mildly alkaline (pH 7.8); abrupt irregular boundary.
C1ca	13-21"	White (10YR8/2) very gravelly loam, yellowish brown (10YR5/6) moist; massive; slightly hard, friable sticky, plastic; plentiful very fine and plentiful fine roots; violently effervescent; moderately alkaline (pH 8.0); abrupt irregular boundary.
11C2	21-28"	Yellow (10YR7/6) clay loam, brownish yellow (10YR6/8) moist; massive; slightly hard, friable, sticky, plastic; few very fine and few fine roots; violently effervescent; moderately alkaline (pH 8.2); clear smooth boundary.
11C3	28-40"+	Light yellowish brown (10YR6/4) very gravelly clay loam, yellowish brown (10YR5/4) moist; massive slightly hard, friable, sticky, plastic; few fine roots; violently effervescent; moderately alkaline (pH 8.2).

APPENDIX B-5

Coarse-loamy, mixed, frigid family of Xerollic Camborthids

Typically these soils have a 9- inch ochric epipedon over a massive, silty clay loam cambic horizon. Reaction of the solum increases with depth and ranges from strongly to very strongly alkaline.

These soils are usually found at elevations around 5125 feet and are associated with the *Chrysothamnus nauseosus* community. They are found on east facing drainage bottoms of 1%. Macrorelief is flat and microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 6.8 inches. Stoniness class is 0. The majority of roots are found within 26 inches of the soil surface. Erosion is slight to none.

A11	0-4"	Very pale brown (10YR7/2) silt loam, dark brown (10YR4/2) moist; moderate fine platy; slightly hard, very friable, nonsticky, nonplastic; few very fine and few fine roots; organic matter 5.9%, conductivity 2.1 mmhos., cation exchange capacity 40.1 meq.; slightly effervescent; strongly alkaline (pH 8.8); vesicular pores; abrupt smooth boundary.
A12	4-9"	Light brownish gray (10YR6/2) loam, very dark grayish brown (10YR3/2) moist; weak medium platy; soft, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and plentiful medium roots; strongly effervescent; strongly alkaline (pH 8.8); abrupt smooth boundary.
IIB2	9-28"	Dark grayish brown (10YR4/2) moist; silty clay loam; massive; hard, friable, firm, sticky, plastic; plentiful very fine, plentiful fine roots; organic matter 2.1%, conductivity 7.0 mmhos.; violently effervescent; very strongly alkaline (pH 9.1); clear smooth boundary.
IIClca	28-40"+	Very dark brown (10YR2/2) moist; silty clay loam; massive; hard, firm, sticky, plastic; few very fine, few fine roots; violently effervescent; strongly alkaline (pH 8.8).

APPENDIX B-6

Loamy-skeletal, mixed, frigid, shallow family of Xerollic Camborthids

These soils typically have a 3- inch ochric epipedon over a massive, very gravelly sandy clay loam cambic horizon and sandstone within 10 inches of the soil surface. Reaction of the solum is moderately alkaline.

These are usually found at elevations around 5350 feet and are associated with the *Juniperus osteosperma/Artemisia nova/Agropyron spciatum* community. They are found on northeast facing slopes of 17%. The macrorelief is hilly and the microrelief is convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 0.8 inch. Stoniness class is 3. The majority of roots are found within 10 inches of the soil surface. There is slight to no erosion.

A1	0-3"	Grayish brown (10YR5/2) gravelly sandy loam, dark brown (10YR3/3) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; few very fine and few fine roots; organic matter 2.8%, conductivity 0.5 mmho.; cation exchange capacity 21.0 meq.; noneffervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
B2	3-10"	Brown (10YR5/3) very gravelly sandy clay loam, dark yellowish brown (10YR3/3) moist, massive; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine, abundant fine, few medium and few coarse roots; organic matter 0.6%, conductivity 0.4 mmho.; noneffervescent; moderately alkaline (pH 8.0); abrupt irregular boundary.
R1	10"+	Sandstone with violent effervescense in fissures.

APPENDIX B-7

Loamy-skeletal, mixed, frigid, shallow family of Durixerollic Camborthids

These soils characteristically have a 7- inch ochric epipedon over a massive gravelly, very fine sandy loam cambic horizon, sandstone within 19 inches of the soil surface and a weakly cemented duripan of 17 inches. These soils are usually found at elevations around 5200 feet and are associated with the *Juniperus osteosperma/Artemisia nova* community. They are found on northeast facing slopes of 45%. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 1.5 inches. Stoniness class is 3. The majority of roots are found within 18 inches of the soil surface. There is slight sheet and rill erosion.

A11	0-3"	Light brownish gray (10YR6/2) gravelly sandy loam, brown (10YR4/3) moist; weak medium platy; slightly hard, very friable, nonsticky, nonplastic; few very fine and few fine roots; organic matter 1.6%, conductivity 0.3 mmho., cation exchange capacity 24.5 meq.; slightly effervescent; moderately alkaline (pH 8.2); vesicular pores; abrupt smooth boundary.
A12	3-7"	Light brownish gray (10YR6/2) gravelly sandy loam, brown (10YR4/3)moist; weak fine granular; slightly hard, very friable, nonsticky, nonplastic; abundant very fine and abundant fine roots; slightly effervescent; moderately alkaline (pH 8.0); clear smooth boundary.
B2	7-17"	Very pale brown (10YR7/3) gravelly very fine sandy loam, brown (10YR5/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; abundant very fine, abundant fine, abundant medium, and plentiful coarse roots; organic matter 1.5%, conductivity 0.7 mmho.; strongly effervescent; moderately alkaline (pH 8.2); clear smooth bounday.
C1ca	17-19"	White (10YR8/2) very pale brown (10YR7/4) moist; massive; extremely hard, extremely firm, nonsticky, nonplastic; few fine roots; violently effervescent; moderately alkaline (pH 8.4); abrupt irregular boundary; weakly cemented duripan.
R1	19-21"	Paralithic contact with sandstone.

APPENDIX B-8

Coarse-loamy, mixed, frigid family of Durixerollic Camborthids

Typically these soils have a 6- inch ochric epipedon over a weak medium subangular blocky, gravelly sandy loam cambic horizon and durinodes within 13 inches of the soil surface. Reaction of the solum increases with depth and ranges from moderately to very strongly alkaline.

These soils are usually found at elevations around 5100 feet and are associated with the *Artemisia tridentata/Agropyron cristatum* community. They are found on east facing drainage bottoms with 2% slope. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.6 inches. Stoniness class is 0. The majority of roots are found within 13 inches of the soil surface. There is slight to no erosion.

AP	0-6"	Light brownish gray (10YR6/2) gravelly sandy loam, dark grayish brown (10YR4/2) moist; massive; slightly hard, friable, nonsticky, nonplastic; few fine roots; organic matter 1.3%, conductivity 0.5 mmho., cation exchange capacity 25.3 meq.; noneffervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
B2	6-13"	Light gray (10YR7/2) gravelly sandy loam, brown (10YR5/3) moist; weak medium subangular blocky; soft, very friable, slightly sticky, slightly plastic; organic matter 0.5%, conductivity 0.6 mmho.; plentiful very fine, plentiful fine and few medium roots; strongly effervescent; strongly alkaline (pH 8.5); clear smooth boundary.
C1	13-17"	Very pale brown (10YR7/3) loam, yellowish brown (10YR5/4) moist; massive; hard, firm, slightly sticky, slightly plastic; few very fine and few fine roots; violently effervescent; strongly alkaline (pH 8.6); 15% durinodes; gradual smooth boundary.
C2	17-36"	Very pale brown (10YR7/3) loam, yellowish brown (10YR5/4) moist; massive; hard, firm, slightly sticky, slightly plastic; few fine roots; violently effervescent; very strongly alkaline (pH 9.0); 75% durinodes.

APPENDIX B-9

Fine-loamy, mixed, frigid family of Durixerollic Camborthids

Characteristically these soils have a 5- inch ochric epipedon over a moderate medium subangular blocky, very gravelly clay loam cambic horizon and a weakly cemented duripan within 13 inches of the soil surface. Reaction of the solum increases with depth and ranges from moderately to strongly alkaline.

These soils are usually found at elevations around 5900 feet and are associated with the *Artemisia nova/Sitanion hystrix* community. They are found on north facing terraces with 3% slope. Macrorelief is rolling and microrelief is uniform convex. These soils belong to the B hydrologic group and have a profile available water holding capacity of 1.9 inches. Stoniness class is 2. The majority of roots are found within 13 inches of the soil surface. There is slight to no erosion.

A11	0-2"	Light gray (10YR7/1) gravelly clay loam, grayish brown (10YR5/2) moist; moderate fine platy; slightly hard, friable, sticky, plastic; few fine roots; organic matter 3.1%, conductivity 0.2 mmho., cation exchange capacity 9.2 meq.; noneffervescent; moderately alkaline (pH 8.0) vesicular pores; abrupt smooth boundary.
A12	2-5"	Light brownish gray (10YR6/2) gravelly clay loam, dark brown (10YR3/3) moist; moderate fine granular; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine, plentiful medium and few coarse roots; nonefferves-cent; moderately alkaline (pH 8.4); abrupt smooth boundary.
B2	5-13"	Very pale brown (10YR7/3) very gravelly clay loam, dark yellowish brown (10YR4/4) moist; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; organic matter 2.4%, conductivity 0.8 mmho.; plentiful very fine and plentiful fine roots; strongly effer-vescent; strongly alkaline (pH 8.8); clear smooth boundary.
C1casim	13-18"+	Very pale brown (10YR4/4) light yellowish brown (10YR6/4) moist; massive; hard, firm, nonsticky, nonplastic; few fine roots; violently effer-vescent; strongly alkaline (pH 8.8); weakly cemented duripan.

APPENDIX B-10

Fine-skeletal, mixed, frigid, shallow family of Xerollic Haplargids

Typically these soils have a 3- inch ochric epipedon over a weak medium subangular blocky, gravelly clay loam argillic horizon and paralithic contact within 13 inches of the soil surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 5400 feet and are associated with the *Juniperus osteosperma* community. They are found on south facing slopes of 29%. Macrorelief is hilly and microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 0.9 inch. Stoniness class is 3. The majority of roots are found within 13 inches of the soil surface. There is slight to moderate sheet and rill erosion.

A1	0-3"	Very pale brown (10YR7/3) very gravelly sandy loam, brown (10YR4/3) moist; weak medium granular; soft, very friable, nonsticky, nonplastic; plentiful very fine and plentiful fine roots; organic matter 1.2%, conductivity 0.4 mmho., cation exchange capacity 15.7 meq.; noneffervescent; neutral (pH 7.0); vesicular pores in upper 1- inch; abrupt smooth boundary.
B1	3-6"	Light brownish gray (10YR6/2) gravelly clay loam, dark yellowish brown (10YR3/4) moist; weak medium subangular blocky; slightly hard friable, sticky, plastic; abundant fine, plentiful very fine, few medium and few coarse roots; noneffervescent; neutral (pH 7.2); abrupt smooth boundary.
B2	6-13"	Dark yellowish brown (10YR4/4) moist; moderate medium subangular blocky; gravelly clay loam; slightly hard, friable, very sticky, very plastic; plentiful very fine, plentiful fine, few medium and few coarse roots; organic matter 0.8%, conductivity 0.2 mmho.; noneffervescent; mildly alkaline (pH 7.4); abrupt irregular boundary; few clay films.
R1	13"+	Paralithic contact with tuff.

APPENDIX B-11

Fine, mixed, frigid, shallow family of
Xerollic Haplargids

These soils characteristically have a 2- inch ochric epipedon over a moderate fine granular, light clay argillic horizon and paralithic contact within 7 inches of the soil surface. The reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 5900 feet and are associated with *Artemisia nova/Poa secunda* community. They are situated on east facing ridge tops with 4% slope. The macrorelief is hilly and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 1.3 inches. Stoniness class is 3. The majority of roots are found within 7 inches of the soil surface. There is slight to moderate sheet and rill erosion.

A1	0-2"	Pale brown (10YR6/3) gravelly sandy clay loam, brown (10YR4/3) moist; weak medium platy; soft, very friable , slightly sticky, slightly plastic; abundant very fine and abundant fine roots organic matter 1.7%, conductivity 0.1 mmho., cation exchange capacity 50.0 meq.; nonefferves-cent; neutral (pH 7.2); vesicular pores; abrupt smooth boundary.
B2t	2-7"	Dark yellowish brown (10YR3/4) moist; light clay; moderate fine granular; slightly hard, firm, very sticky, very plastic; abundant very fine, abundant fine and few medium roots; organic matter 1.1%, conductivity 0.8 mmho.; noneffervescent; mildly alkaline (pH 7.6); abrupt smooth boundary.
R1	7-20"+	Dark yellowish brown (10YR4/4) moist; massive; very hard, extremely firm, nonsticky, non-plastic; few very fine and few fine roots; violently effervescent in fissures; mildly alkaline (pH 7.8); weathered sandstone.

APPENDIX B-12

Loamy-skeletal, mixed, frigid family of Xerollic Haplargids

Typically these soils have a 4-inch ochric epipedon over a moderate fine subangular blocky, very gravelly clay loam B2t horizon. Reaction of the solum increases with depth and ranges from mildly to strongly alkaline.

These soils are usually found at elevations around 6400 feet and are associated with the *Artemisia nova/Poa secunda* community. They are found on west facing slopes of 13%. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 1.7 inches. Stoniness class is 2. There is no evidence of erosion.

A1	0-4"	Light brownish gray (10YR6/2) gravelly sandy clay loam, dark grayish brown (10YR4/2) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 2.8%, conductivity 0.2 mmho., cation exchange capacity 37.5 meq.; noneffervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.
B2t	4-11"	Light yellowish brown (10YR6/4) very gravelly clay loam, dark yellowish brown (10YR4/4) moist; moderate fine subangular blocky; slightly hard, friable, sticky, slightly plastic; plentiful very fine, plentiful fine and few medium roots; organic matter 2.4%, cation exchange capacity 0.5 mmho.; noneffervescent; mildly alkaline (pH 7.6); clay films; clear smooth boundary.
B3	11-14"	Light yellowish brown (10YR6/4) very gravelly sandy loam, dark yellowish brown (10YR4/4) moist; massive; slightly hard, friable nonsticky, nonplastic; few fine roots; noneffervescent; moderately alkaline (pH 8.2); clear smooth boundary.
C1ca	14-24"+	Very pale brown (10YR8/3) very gravelly sandy loam. yellowish brown (10YR5/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; few fine roots; violently effervescent; strongly alkaline (pH 8.5).

APPENDIX B- 13

Clayey-skeletal, mixed, frigid family of Xerollic Haplargids

These soils characteristically have a 14-inch ochric epipedon over a moderate fine subangular blocky, very gravelly clay argillic horizon. Reaction of the solum increases with depth and ranges from mildly to moderately alkaline.

These soils are usually found at elevations around 6900 feet and are associated with the *Artemisia nova/Agropyron spicatum* community. They are usually found on west facing slopes of 29%. Macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 2.1 inches. The majority of roots are found within 20 inches of the soil surface. There is no evidence of soil erosion.

A11	0-3"	Grayish brown (10YR5/2) gravelly loam, very dark grayish brown (10YR3/2) moist; weak fine platy; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; organic matter 2.9%, conductivity 0.5 mmho., cation exchange capacity 27.1 meq.; noneffervescent; mildly alkaline (pH 7.6); abrupt smooth boundary.
A12	3-14"	Grayish brown (10YR5/2) very gravelly loam, very dark grayish brown (10YR3/2) moist; moderate fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and plentiful medium roots; noneffervescent; mildly alkaline (pH 7.8); clear smooth boundary.
B2t	14-23"	Pale brown (10YR6/3) very gravelly clay, brown (7.5YR4/4) moist; moderate fine subangular blocky; slightly hard, friable, very sticky, very plastic; few very fine, few fine, and few medium roots; organic matter 1.3%, conductivity 0.4 mmho.; noneffervescent; moderately alkaline (pH 8.0), few clay films, abrupt smooth boundary
C1ca	23-30"+	Very pale brown (10YR7/3) very gravelly sandy loam, yellowish brown (10YR5/4) moist; single grain, slightly hard, friable, nonsticky, nonplastic; slightly effervescent; moderately alkaline (pH 8.4).

APPENDIX B-14

Coarse-loamy, mixed, frigid family of Xerollic Haplargids

These soils typically have a 10-inch ochric epipedon over a moderate medium subangular blocky, sandy clay argillic horizon. Reaction of the solum increases with depth and ranges from mildly to moderately alkaline.

These soils are usually found at elevations around 5500 feet and are associated with the *Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum* community. They are found on north facing slopes of 18%. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.6 inches. Stoniness class is 0. The majority of roots are found within 18 inches of the soil surface. There is slight to no erosion.

A1	0-3"	Light brownish gray (10YR6/2) gravelly fine sandy loam, very dark grayish brown (10YR3/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine, plentiful fine and few medium roots; organic matter 1.5%, conductivity 0.2 mmho., cation exchange capacity 15.5 meq.; noneffervescent; mildly alkaline (pH 7.6); abrupt smooth boundary.
A3	3-10"	Pale brown (10YR6/3) gravelly fine sandy loam, brown (10YR4/3) moist; weak medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; abund- and very fine, abundant fine and few medium roots; noneffervescent; neutral (pH 7.2); clear smooth boundary.
B2t	10-21"	Dark yellowish brown (10YR4/4) moist; sandy clay; moderate medium subangular blocky; slightly hard, friable, very sticky, plastic; abundant very fine, abundant fine and few medium roots; organic matter 1.5% conductivity 0.8 mmho.; noneffervescent; mildly alkaline (pH 7.6); few clay films; clear smooth boundary.
B3	21-27"	Light yellowish brown (10YR6/4) gravelly loamy sand, dark yellowish brown (10YR4/4); massive; hard, friable, nonsticky, non-plastic; few fine roots; noneffervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.

APPENDIX B-14 (Cont'd)

C1	27-35"+	Very pale brown (10YR7/4) very gravelly loamy sand, brown (10YR5/3) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; slightly effervescent; moderately alkaline (pH 8.2).

APPENDIX B-15

Fine, mixed, frigid family of Xerollic Haplargids

These soils characteristically have a 5-inch ochric epipedon over a strong medium angular blocky, clay argillic horizon, and weathered sandstone within 26 inches of the soil surface. The reaction of the solum increases with depth and ranges from mildly to moderately alkaline.

These soils are usually found at elevations around 5500 feet and are associated with the *Artemisia tridentata/Agropyron smithii/Poa nevadensis* community. These soils are found on east facing fans with 1% slope. The macrorelief is undulating and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.3 inches. Stoniness class 0. Majority of roots are found within 13 inches of the soil surface. There is very slight to some advanced gully erosion.

A1	0-5"	Light brownish gray (10YR6/2) fine sandy loam, dark brown (10YR3/3) moist; weak medium platy; slightly hard, friable, nonsticky, nonplastic; abundant very fine, plentiful fine and few medium roots; organic matter 1.7%, conductivity 0.2 mmho., cation exchange capacity 24.8 meq.; noneffervescent; mildly alkaline (pH 7.8); vesicular pores; abrupt smooth boundary.
B21t	5-13"	Dark yellowish brown (10YR4/4) moist; clay; strong medium angular blocky, hard, firm, very sticky, very plastic; abundant fine, abundant very fine, plentiful medium and few coarse roots; noneffervescent; moderately alkaline (pH 7.8); clay films; clear smooth boundary.
B22t	13-18"	Dark yellowish brown (10YR4/4) moist; clay; moderate medium angular blocky; hard, firm, very sticky, very plastic; few very fine, few fine and few medium roots; organic matter 0.6%; conductivity 0.2 mmho., noneffervescent; moderately alkaline (pH 8.0); clay films, clear smooth boundary.
B3	18-26"	Pale brown (10YR6/3) gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; massive; hard, firm, slightly sticky, slightly plastic; few very fine and few fine roots; noneffervescent; moderately alkaline (pH 8.2); clear smooth boundary.

APPENDIX B-15 (Cont'd)

Rca	26-37"	Light yellowish brown (10YR6/4) weathered sandstone, yellowish brown (10YR5/4) moist; massive; strongly effervescent; strongly alkaline (pH 8.6).

APPENDIX B-16

Fine, mixed, frigid family of Xerollic Haplargids

Typically these soils have a 2- inch ochric epipedon over a moderate medium angular blocky, clay argillic horizon. Reaction of the solum increases with depth and ranges from mildly to very strongly alkaline.

These soils are usually found at elevations around 5600 feet and are associated with the *Artemisia tridentata/Sitanion hystrix* community. These soils are found on west facing fans with 2 percent slope. The macrorelief is rolling and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.9 inches. Stoniness class is 1. The majority of roots are found within 10 inches of the soil surface. There is slight to no erosion.

A11	0-2"	Light brownish gray (10YR6/2) gravelly sandy loam, dark grayish brown (10YR4/2) moist; massive; slightly hard, friable, nonsticky, nonplastic; organic matter 1.4%, conductivity 0.2 mmho., cation exchange capacity 36.5 meq.; noneffervescent; mildy alkaline (pH 7.8); vesicular pores; abrupt smooth boundary.
B2t	2-8"	Brown (10YR5/3) clay, dark brown (7.5YR4/4) moist; strong medium angular blocky, extremely hard, extremely firm, very sticky, very plastic; plentiful very fine, plentiful fine and few medium roots; organic matter 0.5%, conductivity 0.6 mmho.; noneffervescent; moderately alkaline (pH 8.0); clay films; clear smooth boundary.
B3	8-11"	Yellow (10YR7/6) very gravelly clay loam, brown (7.5YR5/4); massive slightly hard, friable, sticky, slightly plastic; plentiful very fine and plentiful fine roots; noneffervescent; strongly alkaline (pH 8.8); clear smooth boundary.
Cca	11-32"+	Yellow (10YR7/6) very gravelly sandy loam, brown (7.5YR5.4) moist; massive; soft, friable, nonsticky, nonplastic; few very fine roots; violently effervescent; very strongly alkaline (pH 9.4).

APPENDIX B-17

Fine, mixed, frigid family of Xerollic Haplargids

Characteristically these soils have a 4- inch ochric epipedon over a strong medium angular blocky, gravelly clay argillic horizon, and weathered sandstone within 21 inches of the soil surface. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 6300 feet and are associated with the *Artemisia arbuscula/Poa secunda* community. They are found on west facing slopes of 9 percent. The macrorelief is mountainous and the microrelief is convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.1 inches. Stoniness class is 3. The majority of roots are found within 14 inches of the soil surface. There is very slight to no erosion.

A1	0-4"	Light brownish gray (10YR6/2) gravelly light clay, brown (10YR4/3) moist; moderate fine platy; slightly hard, friable, very sticky, plastic; plentiful very fine and plentiful fine roots; orgnnic matter 1.6%, conductivity 0.2 mmho., cation exchange capacity 16.5 meq.; noneffervescent; neutral (pH 6.6); vesicular pores; aburpt smooth boundary.
B2t	4-16"	Grayish brown (10YR5/2) gravelly clay, dark grayish (10YR4/2) moist; strong medium angular blocky; extremely hard, extremely firm, very sticky, very plastic; plentiful very fine, plentiful fine, and few medium roots; organic matter 1.2%, conductivity 0.25 mmho.; noneffervescent; neutral (pH 6.7); clear smooth boundary; clay films.
B3	16-21"	Very pale brown (10YR7/3) gravelly sandy clay loam, dark yellowish brown (10YR4/4) moist; moderate fine subangular blocky; hard, firm, slightly sticky, slightly plastic; few fine and few very fine roots; noneffervescent; moderately alkaline (pH 8.0); clear smooth boundary.
R1	21-25"+	Very pale brown (10YR8/3) weathered sandstone, yellowish brown (10YR5/4) moist, violently effervescent; mildly alkaline (pH 7.8).

APPENDIX B-18

Fine, mixed, frigid family of Xerollic Haplargids

Typically these soils have a 4- inch ochric epipedon over a moderate medium prismatic, gravelly clay argillic horizon and usually sandstone within 29 inches of the soil surface. Reaction of the solum increases with depth and ranges from neutral to moderately alkaline.

These soils are usually found at elevations around 5460 feet to 6350 feet and are associated with the *Artemisia nova/Poa secunda*, and *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* communities. These are found on west and southwest facing slopes of 12 to 15 percent. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.9 inches. Stoniness class is 2 to 3. The majority of roots are found within 13 inches of the soil surface. There is very slight to no erosion.

A1	0-4"	Light brownish gray (10YR6/2) gravelly fine sandy loam, very dark grayish brown (10YR3/2) moist; weak medium platy; slightly hard, friable, nonsticky, nonplastic; plentiful very fine and plentiful fine roots; organic matter 3.1%, conductivity 0.8 mmho., cation exchange capacity 16.5 meq.; noneffervescent; neutral (pH 7.2); vesicular pores; aburpt smooth boundary.
B2t	4-13"	Grayish brown (10YR5/2) gravelly clay, brown (10YR4/3) moist; moderate fine subangular blocky; hard, firm, very sticky, very plastic; abundant very fine, abundant fine and few medium roots; organic matter 2.2%, conductivity 0.4 mmho.; noneffervescent; mildly alkaline (pH 7.6); clear smooth boundary.
C1ca	13-29"	Very pale brown (10YR7/3) very gravelly loamy sand, dark yellowish brown (10YR4/4) moist; massive; extremely hard, extremely firm, nonsticky, nonplastic; plentiful fine and few very fine and few fine medium roots; strongly effervescent; moderately alkaline (pH 8.4); lime mottles; gradual smooth boundary.
R1	29"+	Very pale brown (10YR8/3) sandstone, yellowish brown (10YR5/4).

APPENDIX B-19

Very-fine, mixed, frigid family of Duri Xerollic Haplargids

Characteristically these soils have a 6- inch ochric epipedon over a weak medium subangular blocky, clay loam argillic horizon, and a weakly cemented duripan within 26 inches of the soil surface. Reaction of the solum increases with depth and ranges from neutral to strongly alkaline.

These soils are usually found at elevations around 6000 feet and are associated with the *Artemisia tridentata/Stipa thurberiana* community. They are found on north facing fans with 3% slope. The macrorelief is rolling and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.2 inches. Stoniness class is 0. The majority of roots are found within 20 inches of the soil surface. There is no evidence of erosion.

A1	0-6"	Grayish brown (10YR5/2) sandy clay loam, very dark grayish brown (10YR3/2) moist; moderate fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; organic matter 2.8%, conductivity 0.4 mmho., cation exchange capacity 23.9 meq.; noneffervescent; neutral (pH 7.2); vesicular pores; abrupt smooth boundary.
B1	6-9"	Light brownish gray (10YR6/2) clay loam, dark grayish brown (10YR4/2) moist; weak medium subangular blocky; slightly hard; friable, sticky, plastic; abundant very fine and abundant fine roots; noneffervescent; mildly alkaline (pH 7.6); clear smooth boundary.
B2t	9-22"	Dark yellowish brown (10YR4/4) moist; gravelly clay, strong medium subangular blocky; hard, firm, very sticky, very plastic; plentiful very fine, plentiful fine, and few medium roots; organic matter 0.8%, conductivity 0.3 mmho.; noneffervescent; moderately alkaline (pH 8.0); clay film; gradual smooth boundary.
B3t	22-26"	Dark yellowish brown (10YR4/4) moist; gravelly clay; moderate medium subangular blocky; slightly hard, friable, very sticky, very plastic; plentiful fine roots; slightly effervescent; moderately alkaline (pH 8.4); clay film; abrupt smooth boundary.

APPENDIX B-19 (Cont'd)

C1casim	26-34"+	Very pale brown (10YR8/3) gravelly sandy loam, weakly cemented duripan, light yellowish brown (10YR6/4) moist; massive; slightly hard, friable, firm, nonsticky, nonplastic; violently effervescent; strongly alkaline (pH 8.8).

APPENDIX B-20

Fine-skeletal, mixed, frigid family of Xerollic Durargids

Typically these soils have a 3-inch ochric epipedon over a moderate subangular blocky, gravelly clay loam argillic horizon and a indurated duripan within 10 inches of the soil surface. Reaction of the solum increases with depth and ranges from mildly to strongly alkaline.

These soils are usually found at elevations around 5400 feet and are associated with the *Juniperus osteosperma/Artemisia nova/Agropyron spicatum* community. They are found on north facing fans with 4 to 10% slopes. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 0.7 inch. Stoniness class is 1. The majority of roots are found within 7 inches of the soil surface. There is slight to no erosion.

A1	0-3"	Light brownish gray (10YR6/2) gravelly fine sandy loam, dark grayish brown (10YR4/2) moist; weak fine platy; soft, very friable, nonsticky, nonplastic; plentiful very fine and few fine roots; organic matter 1.6%, conductivity 0.3 mmho., cation exchange capacity 21.5 meq.; non-effervescent; mildly alkaline (pH 7.6); vesicular pores; abrupt smooth boundary.
B2t	3-8"	Brown (10YR5/3) gravelly clay loam, dark brown (7.5YR4/4) moist; moderate subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine, abundant fine, abundant medium and plentiful coarse roots; organic matter 1.4%, conductivity 0.5 mmho.; noneffervescent; moderately alkaline (pH 8.2); abrupt smooth boundary.
C1casim	8-10"+	Pale brown (10YR6/3) indurated duripan, dark yellowish brown (10YR4/4) moist; massive; extremely hard, extremely firm; violently effervescent; strongly alkaline (pH 8.6).

APPENDIX B-23

Fine-loamy, mixed, frigid family of Cumulic Haplaquolls

These soils typically have a 30-inch mollic epipedon, with mottles within 30 inches of the soil surface. The reaction of the solum decreases with depth and ranges from nuetral to mildly alkaline.

These soils are usually found at elevations around 6400 feet and are associated with the *Populus tremuloides/Poa nevadensis/Taraxacum officinale* community. They are found in south facing drainage bottoms with 2% slope. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 6.0 inches. Stoniness class is 0. The majority of roots are found within 28 inches of the soil surface. There is slight to moderate gully erosion.

A11	0-4"	Gray (10YR5/1) silty loam, black (10YR2/1) moist; strong very fine platy; hard, firm, slightly sticky, slightly plastic; few very fine, few fine and few coarse roots; organic matter 8.3%, conductivity 0.35 mmho., cation exchange capacity 65.0 meq.; noneffervescent; mildly alkaline (pH 7.8); abrupt smooth boundary.
A12	4-15"	Black (10YR2/1) moist; silty clay loam; massive; soft, very friable, sticky, plastic; plentiful very fine, plentiful fine, abundant medium, and few coarse roots; noneffervescent; neutral (pH 7.2); clear smooth boundary.
C1	15-32"	Very dark brown (10YR2/2) moist; clay loam; massive; slightly hard, friable, sticky, plastic; few very fine, few fine, plentiful medium and plentiful coarse roots; noneffervescent; neutral (pH 6.8); gradual smooth boundary.
C2	32-38"+	Very dark grayish brown (10YR3/2). sandy clay loam, olive brown (2.5Y4/4) moist; massive; slightly hard, friable, sticky, plastic; few fine roots; noneffervescent; neutral (pH 7.2); mottles.

APPENDIX B-24

Fine, mixed, frigid family of Cumulic Haplaquolls

These soils typically have a 20-inch mollic epipedon over a massive clay loam IIC1 horizon. Reaction of the solum increases with depth and ranges from slightly to medium acid.

These soils are usually found at elevations around 6000 feet and are associated with the *Juncus balticus/Poa nevadensis* community. They are found on southeast facing drainage bottoms with 2% slope. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 5.7 inches. Stoniness class is 0. The majority of roots are found within 20 inches of the soil surface. There is no evidence of erosion.

A1 *	0-9"	Grayish brown (10YR5/2) sandy clay loam, very dark brown (10YR2/2) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; plentiful very fine and plentiful fine roots; noneffervescent; medium acid (pH6.0); abrupt smooth boundary.
IIc1	9-20"	Black (10YR2/1) moist; clay loam; moderate fine subangular blocky; slightly hard, friable, sticky, plastic; plentiful very fine and plentiful fine roots; noneffervescent; medium acid (pH 6.0); gradual smooth boundary.
IIC2	20-38"+	Black (10YR2/1) heavy clay loam, very dark grayish brown (10YR3/2) moist; massive; slightly hard, friable, sticky, plastic; few fine and few very fine roots; noneffervescent; slightly acid (pH 6.2); mottles.

* Laboratory data missing for this soil.

APPENDIX B-25

Coarse-loamy, mixed, frigid family of Fluventic Haplustolls

Characteristically these soils have a 10-inch mollic epipedon over a massive, gravelly sandy clay loam C1 horizon. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline. This is a Haplustoll that has been drained due to gully erosion.

These soils are usually found at elevations around 6000 feet and are associated with the *Artemisia tridentata/Agropyron smithii* community. They are found on southwest drainage bottoms of 2%. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.1 inches. Stoniness class is 0. The majority of roots are found within 20 inches of the soil surface. Erosion is largely confined to the gulley that disects this community.

A1	0-10"	Grayish brown (10YR5/2) sandy clay loam very dark grayish brown (10YR3/2) moist; weak fine granular; soft very friable, slightly sticky, plastic; plentiful very fine and plentiful fine roots; organic matter 2.3%, conductivity 0.1 mmho.; cation exchange capacity 20.0 meq.; noneffervescent; neutral (pH 7.2); clear smooth boundary.
IIC1	10-22"	Light brownish (10YR6/2) gravelly sandy clay loam, very dark grayish brown (10YR3/2) moist; massive; soft, very friable, slightly sticky, slightly plastic; abundant very fine and abundant fine roots; noneffervescent; mildly alkaline (pH 7.6); clear smooth boundary.
IIIC2	22-34"	Pale brown (10YR6/3) sandy loam, dark yellowish brown (10YR3/4) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine and plentiful fine roots; noneffervescent; mildly alkaline (pH 7.6); few mottles.

APPENDIX B-26

Fine-loamy, mixed, frigid family of Fluventic Haplustolls

These soils characteristically have a 13-inch mollic epipedon over a massive, silty clay loam cambic horizon. Reaction of the solum increases with depth and ranges from moderately to strongly alkaline.

These soils are usually found at elevations around 5400 feet and are associated with the *Artemisia tridentata/Chrysothamnus nauseosus* community. They are found on southwest and east facing drainage bottoms with 1% slope. The macrorelief is flat and the microrelief is uniform flat. These soils belong to the C hydrologic group and the profile available water holding capacity of 6.1 inches. Stoniness class is 0. The majority of roots are found within 13 inches of the soil surface. Erosion is mostly confined to the gullies which disect the community.

A1	0-4"	Grayish brown (10YR5/2) silty loam, dark brown (10YR3/3) moist; weak fine granular; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; organic matter 6.5%, conductivity 1.2 mmho., cation exchange capacity 62.2 meq.; noneffervescent; moderately alkaline (pH 8.1); abrupt smooth boundary.
A12	4-13"	Grayish brown (10YR5/2) silty loam, very dark grayish brown (10YR3/2) moist; moderate medium platy; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, plentiful medium and few coarse roots; noneffervescent; strongly alkaline (pH 8.8); abrupt wavy boundary.
IIB2	13-19"	Grayish brown (2.5Y5/2) silty clay loam, very dark grayish brown (10YR2/2) moist; massive; hard, firm sticky, plastic; few very fine, few fine and few medium roots; organic matter 1.4%, conductivity 11.0 mmho.; violently effervescent; strongly alkaline (pH 8.8); many tubular pores; clear smooth boundary.
IIC1	19-23"	Light brownish gray (10YR6/2) silt loam, very dark brown (10YR2/2) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine, few fine and few medium roots; slightly effervescent; moderately alkaline (pH 8.4); few tubular pores; clear smooth boundary.

APPENDIX B-26 (Cont'd)

IIC2	23-38"+	Very dark grayish brown (10YR3/2) moist; silt loam; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine and few medium roots; noneffervescent; moderately alkaline (pH 8.1).

APPENDIX B-27

Fine, mixed, frigid family of Pachic Argiustolls

These soils characteristically have a 24-inch mollic epipedon over and in conjunction with a moderate medium subangular blocky, clay argillic horizon, and paralithic contact with sandstone. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline. This soil has been gullied and drained.

These soils are usually found at elevations around 6300 feet and are associated with the *Artemisia tridentata/Agropyron smithii* community. They are found on south facing drainage bottoms with 1% slope. The macrorelief is undulating and the microrelief is uniform flat. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.5 inches. Stoniness class is 0. The majority of roots are found within 24 inches of the soil surface. Active erosion is confined to the gully which disects this community.

A1	0-5"	Dark grayish brown (10YR4/2) silt loam, black (10YR2/1) moist; strong fine platy; slightly hard, friable, slightly sticky, nonplastic; plentiful very fine and plentiful fine roots; organic matter 4.0%; conductivity 0.8 mmho., cation exchange capacity 27.5 meq.; noneffervescent; neutral (pH 6.6); abrupt smooth boundary.
B21t	5-14"	Dark grayish brown (10YR4/2) light clay, black (10YR2/1) moist; moderate medium subangular blocky; hard, firm, very sticky, very plastic; plentiful very fine and plentiful fine roots; noneffervescent; neutral (pH 7.0); clear smooth boundary.
B22t	14-24"	Very dark brown (10YR2/2) moist; heavy clay; moderate medium prismatic; extremely hard, firm, very sticky, very plastic; plentiful very fine, plentiful fine, and few medium roots; organic matter 1.5%, conductivity 0.15 mmho.; noneffervescent; mildly alkaline (pH 7.5); few tubular pores; mottles; abrupt smooth boundary.
R1	24-28"+	Very pale brown (10YR8/3) paralithic contact with sandstone, dark grayish brown (2.5Y4/2) moist; noneffervescent; neutral (pH 7.2).

APPENDIX B-28

Coarse-loamy, mixed, frigid family of Cumulic Haploxerolls

Characteristically these soils have a 24-inch mollic epipedon over a massive, gravelly sandy clay loam C1 horizon. Reaction of the solum is neutral.

These soils are usually found at elevations around 6600 feet and are associated with the *Artemisia tridentata/Symphoricarpos longiflorus/Agropyron spicatum* community. They are found on east facing slopes of 10 to 20%. The macrorelief is mountainous and the microrelief is concave. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.7 inches. Stoniness class is 0. The majority of roots are found within 20 inches of the soil surface. There is no evidence of erosion.

A11	0-3"	Dark grayish brown (10YR4/2) silt loam, black (10YR2/1) moist; moderate fine platy; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; organic matter 7.9%, conductivity 0.9 mmho., cation exchange capacity 34.5 meq.; noneffervescent; neutral (pH 6.6); abrupt smooth boundary.
A12	3-11"	Dark grayish brown (10YR4/2) gravelly silt loam, black (10YR2/1) moist; moderate medium subangular blocky; slightly hard, friable, sticky, slightly plastic; abundant very fine, abundant fine and few medium roots; noneffervescent; neutral (pH 6.6); gradual smooth boundary.
A13	11-24"	Dark grayish brown (10YR4/2) gravelly silt loam, black (10YR2/1) moist; moderate medium subangular blocky; slightly hard, friable, sticky, slightly plastic; plentiful very fine, plentiful fine, and few medium roots; noneffervescent; neutral (pH 6.6); clear smooth boundary.
C1	24-36"+	Brown (10YR5/3) gravelly sandy clay loam, very dark brown (10YR2/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; plentiful very fine, plentiful fine and few medium roots; noneffervescent; slightly acid (pH 6.2).

APPENDIX B-29

Loamy-skeletal, mixed, frigid family of Typic Argixerolls

Characteristically these soils have a 15-inch mollic epipedon over, and in conjunction with, a moderate medium subangular blocky, very gravelly clay loam argillic horizon. Reaction of the solum is slightly acid.

These soils are usually found at elevations around 7000 feet and are associated with the *Populus tremuloides/Prunus virginiana* community. They are usually found on northeast slopes of 28%. The macrorelief is mountainous and the microrelief is uniform concave. These soils belong to the C hydrologic group and have a profile available water holding capacity of 2.0 inches. Stoniness class is 3. The majority of roots are found within 20 inches of the soil surface. There is very slight to no erosion.

A1	0-7"	Very dark grayish brown (10YR3/2) gravelly sandy loam, black (10YR2/1) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine, plentiful medium and few coarse roots; organic matter 7.4%, conductivity 0.15 mmho., cation exchange capacity 1.2 meq.; noneffervescent; medium acid (pH 6.0); abrupt smooth boundary.
B2t	7-15"	Dark brown (7.5YR3/2) moist; very gravelly clay loam; moderate medium subangular blocky; slightly hard, friable, sticky, plastic; abundant very fine, plentiful fine, plentiful medium and few coarse roots; noneffervescent; slightly acid (pH 6.1); clay film; clear smooth boundary.
C1	15-29"+	Dark yellowish brown (10YR4/4) moist; very gravelly sandy clay loam; massive; soft, very friable, slightly sticky, slightly plastic; plentiful very fine, and plentiful fine roots; noneffervescent; medium acid (pH 6.0).

APPENDIX B-30

Fine, mixed frigid, shallow family of Typic Argixerolls

These soils typically have a 6-inch mollic epipedon over a moderate medium subangular blocky, clay argillic horizon, and paralithic contact within 19 inches of the soil surface. Reaction of the solum increases with depth and ranges from neutral to moderately alkaline.

These soils are usually found at elevations around 5800 feet and are associated with the *Artemisia tridentata/Chrysothamnus visidiflorus/Poa secunda* community. They are found on south facing terraces with 25% slope. Macrorelief is rolling and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 2.5 inches. Stoniness class is 2. The majority of roots are found within 14 inches of the soil surface. There is no evidence of erosion.

A11	0-2"	Grayish brown (10YR5/2) gravelly clay loam, dark brown (10YR3/3) moist; moderate fine platy; slightly hard, friable, sticky, plastic; few fine roots; organic matter 1.6%, conductivity 0.4 mmho., cation exchange capacity 21.8 meq.; noneffervescent; neutral (pH 6.6); vesicular pores; abrupt smooth boundary.
A12	2-6"	Grayish brown (10YR5/2) clay loam, dark brown (10YR3/3) moist; weak fine platy; slightly hard, friable, sticky, plastic; abundant very fine, abundant fine and few medium roots; nonefferves-cent; neutral (pH 6.8); abrupt smooth boundary.
B2t	6-14"	Dark yellowish brown (10YR4/4) moist; clay; moderate medium subangular blocky; hard, firm, very sticky, very plastic; abundant very fine, abundant fine and few medium roots; organic matter 0.8%, conductivity 0.15 mmho.; noneffer-vescent; mildly alkaline (pH 7.8); clay films; clear smooth boundary.
C1	14-19"	Very pale brown (10YR7/3) weathered sandstone, yellowish brown (10YR5/4) moist; massive; hard, firm, nonsticky, nonplastic; few fine roots; noneffervescent; moderately alkaline (pH 8.2); clear smooth boundary.
R1	19+	Very pale brown (10YR7/4) sandstone, light yellow-ish brown (10YR6/4) moist; massive; extremely hard, extremely firm, nonsticky, nonplastic; non-effervescent; moderately alkaline (pH 8.4).

APPENDIX B-31

Loamy-skeletal, mixed, frigid family of Typic Argixerolls

These soils typically have a 14-inch mollic epiepdon over a moderate medium subangular blocky, very gravelly sandy clay loam argillic horizon. Reaction of the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations around 6100 feet and are associated with the *Amelanchier pallida/Artemisia tridentata/Agropyron spicatum* community. They are found on east facing slopes of 29%. The macrorelief is hilly and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 2.4 inches. Stoniness class is 1. The majority of roots are found within 20 inches of the soil surface. There is no erosion evident.

A1	0-6"	Grayish brown (10YR5/2) gravelly very fine sandy loam, very dark brown (10YR2/2) moist; weak fine granular; soft, very friable, nonsticky, nonplastic; abundant very fine, abundant fine and few medium roots; organic matter 4.8%, conductivity 0.2 mmho., cation exchange capacity 30.0 meq.; noneffervescent; neutral (pH 6.6); clear boundary.
A3	6-14"	Grayish brown (10YR5/2) very gravelly sandy clay loam, very dark brown (10YR2/2) moist; weak medium subangular blocky; soft, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, few medium and few coarse roots; noneffervescent; neutral (pH 6.8); clear smooth boundary.
B2t	14-21"	Light yellowish brown (10YR6/4) very gravelly sandy clay loam, dark yellowish brown (10YR3/4) moist; moderate medium subangular blocky; hard, friable, sticky, plastic; plentiful very fine, plentiful fine and few medium roots; organic matter 1.3%, conductivity 0.3 mmho.; non effervescent; neutral (pH 7.0); clear smooth boundary.
C1	21-31"	Very pale brown (10YR7/3) gravelly loamy sand, brown (10YR5/3) moist; massive; slightly hard, friable, nonsticky, nonplastic; few very fine and few fine roots; strongly effervescent; mildly alkaline (pH 7.7).

APPENDIX B-32

Clayey-skeletal, mixed, frigid family of Typic Argixerolls

Characteristically these soils have a 12-inch mollic epipedon over, and in conjunction with, a moderate fine subangular blocky, gravelly clay argillic horizon. Reaction of the solum is neutral.

These soils are usually found at elevations around 6800 feet and are associated with the *Artemisia arbuscula/Poa secunda* community. These soils are found on west facing slopes of 13%. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the D hydrologic group and have a profile available water holding capacity of 3.2 inches. Stoniness class is 2. The majority of roots are found within 14 inches of the soil surface. There is no evidence of erosion.

A1	0-9"	Grayish brown (10YR5/2) gravelly clay loam, black (10YR2/1) moist; weak fine granular; soft, very friable, sticky plastic; abundant very fine, abundant fine and few medium roots; organic matter 3.5%, conductivity 0.1 mmho., cation exchange capacity 23.8 meq.; noneffervescent; neutral (pH 6.6), upper one half-inch vesicular pores; clear smooth boundary.
B1	9-12"	Grayish brown (10YR5/2) gravelly clay, very dark grayish brown (10YR3/2) moist; moderate fine subangular blocky; slightly hard, friable, very sticky, very plastic; abundant very fine, abundant fine and plentiful medium roots; non effervescent; neutral (pH 6.6); clear smooth boundary.
B2t	12-32"	Light yellowish brown (10YR6/4) gravelly clay, dark yellowish brown (10YR3/4) moist; strong fine subangular blocky; hard, firm very sticky, very plastic; few very fine and few fine roots; organic matter 1.2%, conductivity 0.2 mmho.; noneffervescent; neutral (pH 6.7); clay films; gradual smooth boundary.
B3	32-40"	Light yellowish brown (10YR6/4) very gravelly sandy clay loam; dark yellowish brown (10YR4/4) moist; massive; soft, very friable, slightly sticky, slightly plastic; slightly effervescent; neutral (pH 7.2).

APPENDIX B-33

Fine, mixed, frigid family of Typic Argixerolls

Characteristically these soils have a 14-inch mollic epipedon over a moderate medium subangular blocky, clay loam argillic horizon, and paralithic contact within 29 inches of the soil surface. Reaction to the solum increases with depth and ranges from neutral to mildly alkaline.

These soils are usually found at elevations from 5600 to 6800 feet and are associated with the *Artemisia tridentata/Agropyron smithii* and *Artemisia tridentata/Symphoricarpus longiflorus/Agropyron spicatum* communities. They are found on west facing fans and south facing ridge tops with 3 to 5% slope. The macrorelief is mountainous or undulating and the microrelief is convex to uniform flat. These soils belong to the D hydrologic group and have a profile available water holding capacity of 4.9 inches. Stoniness class is 0. The majority of roots are found within 20 inches of the soil surface.

A1	0-14"	Grayish brown (10YR5/2) sandy clay loam, very dark brown (10YR2/2) moist; weak fine granular; soft, very friable, slightly sticky, nonplastic; abundant very fine, abundant fine and few medium roots; 4.6% organic matter, conductivity 0.4 mmho., cation exchange capacity 34.5 meq.; noneffervescent; neutral (pH 7.0); gradual smooth boundary.
B21t	14-21"	Dark yellowish brown (10YR3/4) moist; clay loam, moderate medium subangular blocky hard, friable, sticky, plastic; plentiful very fine, plentiful fine and few medium roots; organic matter 1.5%, conductivity 0.15 mmho.; noneffervescent; mildly alkaline (pH 7.8); clear smooth boundary.
B22t	21-29"	Dark yellowish brown (10YR4/4) moist; clay; moderate medium subangular blocky; hard, firm, very sticky, very plastic; plentiful very fine, plentiful fine and few medium roots; nonefferves-cent; neutral (pH 6.8); pressure faces; clear smooth boundary.
R1	29-36"	Very pale brown (10YR8/3) weathered sandstone, light yellowish brown (10YR6/4) moist; non-effervescent; neutral (pH 6.6).

APPENDIX B-34

Fine-loamy, mixed, frigid family of Pachic Argixerolls

These soils typically have a 40-inch mollic epipedon over, and in conjunction with, a medium moderate subangular blocky, gravelly silty clay loam argillic horizon. Reaction to the solum increases with depth and ranges from medium acid to mildly alkaline.

These soils are usually found at elevations around 6200 feet and are associated with the *Symphoricarpos longiflorus/Elymus cinereus* community. They are found on north facing slopes of 25 to 45%. The macrorelief is mountainous and the microrelief is uniform convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 4.8 inches. Stoniness class is 1. The majority of roots are found within 30 inches of the soil surface. There is no evidence of erosion.

A0	0-4"	Very dark brown (10YR2/2)organic matter, black (10YR2/1) moist; few very fine and few fine roots; noneffervescent; medium acid (pH 6.0); very abrupt wavy boundary.
A1	4-19"	Very dark grayish brown (10YR3/2) silt loam, black (10YR2/1) moist; weak medium subangular blocky; soft, very friable, slightly sticky, slightly plastic; abundant very fine, abundant fine, few medium, and few coarse roots; organic matter 10.5%, conductivity 0.25 mmho., cation exchange capacity 57.5 meq.; noneffervescent; neutral (pH 7.0); clear smooth boundary.
B2t	19-34"	Dark grayish brown (10YR4/2) gravelly clay loam, very dark brown (10YR2/2) moist; moderate medium subangular blocky; slightly hard, friable, sticky, slightly plastic; plentiful very fine, plentiful fine, few medium and few coarse roots; noneffervescent; neutral (pH 7.2); clay films; clear smooth boundary.
C1	34-40"	Dark grayish brown (10YR4/2) silt loam, very dark grayish brown (10YR) moist; massive slightly hard, friable, slightly sticky, slightly plastic; few medium few very fine and few fine roots; noneffervescent; mildly alkaline (pH 7.4).

APPENDIX B-35

Fine, mixed, frigid family of Pachic Argixerolls

These soils characteristically have a 31-inch mollic epipedon over, and in conjunction with, a strong medium subangular blocky, gravelly clay argillic horizon and paralithic content within 31 inches of the soil surface. Reaction of the solum is mildly alkaline.

These soils are usually found at elevations around 6350 feet and are associated with the *Symphoricarpos longiflorus/Artemisia tridentata/Amelanchier pallida/Festuca idahoensis* community. They are found on northeast facing slopes of 25%. The macrorelief is mountainous and the microrelief is convex. These soils belong to the C hydrologic group and have a profile available water holding capacity of 3.7 inches. Stoniness class is 0. The majority of roots are found within 25 inches of the soil surface. There is no evidence of erosion.

A1	0-9"	Dark yellowish brown (10YR4/4) gravelly loam, black (10YR2/1) moist; moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; abundant very fine, abundant fine and plentiful medium roots; organic matter 5.7%, conductivity 0.2 mmho., cation exchange capacity 31.0 meq.; noneffervescent; neutral (pH 7.2); clear smooth boundary.
B1	9-18"	Dark yellowish brown (10YR4/4) gravelly clay loam, very dark brown (10YR2/2) moist; moderate fine subangular blocky; slightly hard, friable, very sticky, very plastic; plentiful very fine, plentiful fine, and few coarse roots; noneffervescent; slightly acid (pH 7.4) moist; clear smooth boundary.
B21t	18-27"	Dark brown (10YR3/3) moist; gravelly clay; strong medium subangular blocky; hard, firm, very sticky, very plastic; plentiful very fine, plentiful fine and plentiful medium roots; organic matter 1.1%, conductivity 0.2 mmho.; noneffervescent; mildly alkaline (pH 7.4); abrupt smooth boundary.
B22t	27-31"	Very dark grayish brown (10YR3/2) moist; gravelly heavy clay; strong medium prismatic; extremely hard, extremely firm, very sticky, very plastic; a few fine roots; noneffervescent; neutral (pH 6.4); abrupt smooth boundary.

APPENDIX B-35 (Cont'd)

R1	31-37"+	Very pale brown (10YR8/3) sandstone, dark yellowish brown (10YR4/4) moist; noneffervescent; slightly acid (pH 6.4).

APPENDIX C - VEGETATION AND SOIL ASSOCIATION TABLE FOR THE ROCK SPRINGS WATERSHED

COMMUNITIES \ SOILS	Torri-samments	Xeror-thents	Camborthids					Haplargids							Durargids			Haplaquolls		Haplustolls		Argiu-stolls	Haplo-xe-rolls	Argixerolls						
	Sandy, mixed, frigid family of Typic Torripsamments	Sandy, mixed, frigid, shallow family of Typic Xerorthents	Coarse-loamy, mixed frigid family of Xerollic Camborthids	Loamy-skeletal, mixed frigid, shallow family of Xerollic Camborthids	Loamy-skeletal, mixed frigid family of Duri-xerollic Camborthids	Coarse-loamy, mixed frigid family of Duri-xerollic Camborthids	Fine-loamy, mixed, frigid family of Duri-xerollic Camborthids	Fine-skeletal, mixed frigid, shallow family of Xerollic Haplargids	Fine, mixed frigid shallow family of Xerollic Haplargids	Loamy-skeletal, mixed frigid family of Xerollic Haplargids	Clayey-skeletal, mixed frigid family of Xerollic Haplargids	Coarse-loamy, mixed, frigid family of Xerollic Haplargids	Fine, mixed, frigid family of Xerollic Haplargids	Very-fine, mixed, frigid family of Durixerollic Haplargids	Fine-skeletal, mixed, frigid family of Xerollic Durargids	Fine-loamy, mixed, frigid family of Xerollic Durargids	Fine, mixed, frigid family of Xerollic Durargids	Fine-loamy, mixed, frigid family of Cumulic Haplaquolls	Fine, mixed, frigid family of Cumulic Haplaquolls	Coarse-loamy, mixed, frigid family of Fluventic Haplustolls	Fine-loamy, mixed, frigid family of Fluventic Haplustolls	Fine, mixed, frigid family of Pachic Argiustolls	Coarse-loamy, mixed frigid family of Cumulic Haploxerolls	Loamy-skeletal, mixed, frigid family of Typic Argixerolls	Fine, mixed, frigid, shallow family of Typic Argixerolls	Loamy-skeletal, mixed family of Typic Argixerolls	Clayey-skeletal, mixed, frigid family of Typic Argixerolls	Fine, mixed, frigid family of Typic Argixerolls	Fine-loamy, mixed, frigid family of Pachic Argixerolls	Fine, mixed, frigid family of Pachic Argixerolls
Amelanchier pallida/Artemisia tridentata/Agropyron spicatum																											X				
Artemisia arbuscula/ Poa secunda													X															X			
Artemisia nova/ A. spicatum			X								X																				
A. nova/P. secunda									X	X			X																		
A. nova/Sitanion hystrix							X																								
A. tridentata/Agropyron cristatum						X										X															
A. tridentata/Agropyron smithii																				X		X								X	
A. tridentata/A. smithii/ Poa nevadensis													X																		
A. tridentata/Chrysothamnus nauseosus																					X										
A. tridentata/Chrysothamnus viscidiflorus/P. secunda																	X									X					
A. tridentata/S. hystrix													X																		
A. tridentata/Stipa comata	X																														
A. tridentata/S. comata/ A. smithii	X																														
A. tridentata/Stipa thurberiana			X											X																	
A. tridentata/Symphoricarpos longiflorus/A. spicatum																								X						X	
C. nauseosus			X																												
C. viscidiflorus/ S. comata	X																														
Juncus balticus/ P. nevadensis																				X											
Juniperus osteosperma		X						X																							
J. osteosperma/ A. nova					X																										
J. osteosperma/A. nova/ A. spicatum				X									X																		
J. osteosperma/A. tridentata/ A. spicatum												X				X															
J. osteosperma/A. tridentata/ S. comata	X																														
Populus tremuloides/ Prunus virginiana																									X						
P. tremuloides/P. nevadensis/ Taraxacum officinale																			X												
S. longiflorus/A. tridentata/ A. pallida/Festuca idahoensis																															X
S. longiflorus/Elymus cinereus																														X	

ROCK SPRINGS WATERSHED

VEGETATION MAPPING UNITS AND PRECIPITATION, STREAM FLOW RECORDING STATIONS

R.66E.

R.67E.

R.68E.

T.45N.

VEGETATION MAPPING UNITS
LEGEND

Symbol	%	
	60	Artemisia nova/Agropyron spicatum
	40	Juniperus osteosperma/Artemisia nova/Agropyron spicatum
	50	Artemisia nova/Agropyron spicatum
	30	Symphoricarpos longiflorus/Elymus cinereus
	15	Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda
	5	Amelanchier pallida/Artemisia tridentata/Agropyron spicatum Artemisia tridentata/Agrpyron smithii/Poa nevadensis Artemisia tridentata/Stipa comata/Agropyron smithii
	40	Artemisia nova/Poa secunda
	25	Artemisia tridentata/Symphoricarpos longiflorus/Agropyron spicatum
	20	Artemisia arbuscula/Poa secunda
	8	Amelanchier pallida/Artemisia tridentata/Agropyron spicatum
	5	Symphoricarpos longiflorus/Artemisia tridentata/Amelanchier pallida/Festuca idahoensis
	2	Populus tremuloides/Poa nevadensis/Taraxacum officinale Populus tremuloides/Prunus virginiana
	100	Artemisia tridentata/Agropyron cristatum
	70	Artemisia tridentata/Agropyron smithii
	30	Artemisia tridentata/Stipa comata/Agropyron smithii
	60	Artemisia tridentata/Agropyron smithii/Poa nevadensis
	20	Artemisia tridentata/Agropyron smithii
	20	Artemisia tridentata/Stipa comata/Agropyron smithii
	100	Artemisia tridentata/Chrysothamnus nauseosus
	100	Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda
	60	Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda
	20	Artemisia tridentata/Stipa thurberiana
	10	Artemisia tridentata/Sitanion hystrix
	10	Artemisia tridentata/Agropyron smithii Artemisia tridentata/Agropyron smithii/Poa nevadensis Artemisia tridentata/Stipa comata/Agropyron smithii

Symbol	%	
	66	Artemisia tridentata/Stipa comata
	34	Artemisia tridentata/Stipa comata/Agropyron smithii
	1	Chrysothamnus viscidiflorus/Stipa comata
	100	Chrysothamnus nauseosus
	100	Juniperus osteosperma
	65	Juniperus osteosperma/Artemisia nova/Agropyron spicatum
	20	Artemisia nova/Agropyron spicatum
	15	Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda Artemisia tridentata/Stipa comata/Agropyron smithii
	65	Juniperus osteosperma/Artemisia nova/Agropyron spicatum
	20	Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum
	15	Artemisia nova/Agropyron spicatum Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda Artemisia tridentata/Stipa comata/Agropyron smithii
	60	Juniperus osteosperma/Artemisia nova/Agropyron spicatum
	17	Artemisia nova/Agropyron spicatum
	10	Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum
	13	Artemisia tridentata/Agropyron smithii/Poa nevadensis Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda Artemisia tridentata/Stipa comata Artemisia tridentata/Stipa comata/Agropyron smithii
	60	Juniperus osteosperma/Artemisia nova/Agropyron spicatum
	10	Artemisia nova/Agropyron spicatum
	10	Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum
	7	Juniperus osteosperma
	13	Artemisia tridentata/Stipa comata Artemisia tridentata/Stipa comata/Agropyron smithii
	60	Juniperus osteosperma/Artemisia tridentata/Agropyron spicatum
	30	Artemisia tridentata/Chrysothamnus viscidiflorus/Poa secunda
	10	Amelanchier pallida/Artemisia tridentata/Agropyron spicatum Artemisia tridentata/Agropyron smithii/Poa nevadensis Artemisia tridentata/Stipa comata/Agropyron smithii
	100	Juniperus osteosperma/Artemisia tridentata/Stipa comata
	80	Juniperus osteosperma/Artemisia tridentata/Stipa comata
	10	Artemisia tridentata/Stipa comata
	10	Artemisia tridentata/Stipa comata/Agropyron smithii

PRECIPITATION AND STREAM FLOW RECORDING STATIONS

LEGEND

- Stream Flow Recorder
- Peak Flow Gauge
- Rain Can
- Precipitation Recorder

ROAD

LEGEND

IMPROVED DIRT

SCALE

1 .5 0 1 2 Miles

N

Prepared By W.H. Blackburn, 1971, Renewable Resources Center, University Of Nevada, Reno; From Bureau Of Land Management Base Map.

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BUREAU OF LAND

BORROWER'S

S
87
.E4
R4
no.83

Vegetation and soil
Watershed.

DATE LOANED	BORROWER

(Continued on reverse)

Form